NEUROMUSCULAR DISORDERS

RESEARCH PUBLICATIONS

ASSOCIATION FOR RESEARCH IN NERVOUS AND MENTAL DISEASE

World List Abbreviation. Res. Publ. Ass. nerv. ment. Dis.

VOLUME XXXVIII

Editors:

RAYMOND D. ADAMS, M.D.
LEE M. EATON, M.D.
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A list of the previous issues in the Series of Research Publications will be found on verso of title page

NEUROMUSCULAR DISORDERS

(THE MOTOR UNIT AND ITS DISORDERS)

PROCEEDINGS OF THE ASSOCIATION

December 12 and 13, 1958
NEW YORK, N.Y.

BALTIMORE
THE WILLIAMS & WILKINS COMPANY
1960

Research Publications

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XXXVI (1956) The Brain and Human Behavior
XXXVII (1957) The Effect of Pharmacologic Agents on the Nervous System
XXXVIII. (1958) Neuromuscular Disorders

*Out of print—not for sale

Library of Congress Catalog Card No. 60-16864

Printed at the Waverly Press, Inc., Baltimore 2, Md., U. S. A.

Research Publications

*Out of print—not for sale

LIBRARY OF CONGRESS CATALOG CARD NO. 60-16864

Printed at the Waverly Press, Inc, Baltimore 2, Md, U. S A.

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FOREWORD

MORNING SESSION

Friday, December 12, 1958, 9:00 a.m.

Presiding: Dr. Raymond D. Adams

Dr. Francis J. Braceland: Ladies and gentlemen, the trustees and the officers of the Association for Research in Nervous and Mental Disease welcome you.

My function at this time is brief and my duty is sad. Instead of introducing to you the President, Lee M. Eaton, I must announce officially that he died suddenly a short time ago. There will be no eulogy, but a memorial note will be made at this meeting. Dr. Adams will speak about his work, and his program will speak for itself. He had pointed toward this meeting, worked hard preparing for it, looked toward it with joy, for this was to be a crowning achievement, one in which he was to lead a program concerning something he was always interested in. In preparation for it he assembled this great group of scientists, those whom you see on the Commission and those whom you will hear on the Program.

Dr. Adams has consented to carry on for Lee. He was Lee's first choice for Vice-President. There is no need for me to introduce him to most of you. Dr. Raymond D. Adams is the Bullard Professor of Neuropathology at Harvard University and Chief of the Neurology Service at Massachusetts General Hospital.

PREFACE

All of the members of the Commission feel that this, the 38th Annual Meeting of the Association for Research in Nervous and Mental Disease, opens on a somber note because of the death of our distinguished President, Dr. Lee M. Eaton. The Association has been deprived of his leadership and American neurology has lost one of its most eminent clinicians. We extend our sympathy to Mrs. Eaton and others of his family and also offer our condolences to his many friends and colleagues at the Mayo Clinic.

It is fitting and proper at the time of this sad announcement for all of the members of our Association to stand for a minute in respectful silence.

I would propose that our Secretary take note of our sentiments and convey them, at the conclusion of this meeting, to Mrs. Eaton.

This year, as you know, the Trustees of the Association for Research in Nervous and Mental Disease have chosen for the first time the subject of Neuromuscular Disorders. In doing so, they have doubtless heeded two contemporary developments, one the increasing awareness of the large number of untreatable diseases of muscle with which man is afflicted, the other, the powerful motivation on the part of the medical profession and members of related fields of biology, to solve the major problems of medicine by scientific investigation.

The extent of professional and lay interest in unsolved neuromuscular diseases is reflected in the generous use of public funds made available through the National Institute of Neurological Diseases and Blindness under the direction of Dr. Pearce Bailey. This money has been assigned to the support of research in American universities, and in the complex and finely integrated program for the investigation of neuromuscular disorders which was initiated in this Institute under Dr. Milton Shy. Furthermore, two societies, whose aims have been to foster research in muscle disease, have come into existence in the last few years. The first of these is the Muscular Dystrophy Association of America, inspired by Dr. Ade Milhorat and others who have devoted themselves to the study of this group of diseases. The second is the Myasthenia Gravis Foundation, which has received both stimulus and direction from Drs. Henry Viets and Robert Schwab, amongst many others. The influence of these two societies is already manifest in the numerous conferences and symposia which they have endorsed or sponsored and in the funds which they have made available for research.

The medical and lay belief that scientific study provides the only valid

approach to the large problems of medicine has doubtless been engendered recently by notable achievements in both the biological and physical sciences. But more important still has been the rapid development of new biological instruments and techniques whereby the inner machinery of a cell may be explored. It requires but little imagination to see that the application of these methods to muscle diseases offers hope of solving basic problems relating to their causation.

The central idea of this symposium on Neuromuscular Disorders is to summarize the present state of knowledge on the muscle cell and its diseases The scope of the subject is large for scientific and medical developments have proceeded rapidly in recent years. It will be impossible, therefore, to consider many topics in detail. Dr. Eaton realized this and anticipated that even the more complete, published account of the meeting would not satisfy many of our associates in the fields of chemistry, anatomy and pathology. In a letter to me, he stated that he looked upon his selection as Chairman of the Symposium as a mandate to direct the program towards the clinical investigator and practitioner of medicine. The basic scientist, he suggested, will probably turn to other conferences and other writings for specific information and inspiration—such as the one recently held at the New York Academy of Sciences on the Physiological Mechanism of Nerve Activity. To the clinician who may find that too little attention is given in this meeting to muscular dystrophy and myasthenia gravis, he suggested only that the summaries of past and future conferences sponsored by these two special societies will probably fulfill their needs.

The idea of making "disorders of the motor unit" the main subject was Dr. Eaton's own. He justified this on both biological and clinical grounds. One fact is eminently clear—that the muscle cell cannot be considered apart from the nerve cell which governs its activities. And the clinician invariably thinks in terms of diseases of different parts of the motor unit as he attempts to identify these diseases at the bedside, either for purposes of treatment or clinical investigation.

One last word concerning the organization of this meeting. Each conferee has been asked to prepare two papers, a brief one of general interest for oral presentation here and a longer and carefully documented one for the monograph which will summarize our knowledge of muscle disease. The correspondence between these two versions of his communication need not be close. In a few instances authors have been asked to prepare papers on subjects which will not be read but appear only in the Transactions. One example is a summary of myasthenia gravis by Drs. Schwab and Viets, and there are others. This plan was devised in order to attain,

in the words of Dr. Eaton, "an authoritative summing-up of all neuromuscular disorders . . . which will be of practical value to the experienced clinician on the front line of medicine and to the investigator who essays to pry into some narrow part of the broad problem presented by the muscle cell and its pathology".

RAYMOND D. ADAMS

MEMORIAL



LEE McKENDREE EATON

February 3, 1905–November 18, 1958

In October, Lee was in the wilds that he loved. Wherever autumn had touched a tree, he paused to gaze on it reflectively. He lay on the deck of a fishing boat that rolled in the waves of Lake Superior and followed the clouds that told of winter's coming. Of every kind of evergreen that grew on Madeline Island, he swathed one tiny seedling in moss and took it home so that his children might watch it grow.

"We have time," he said, as we returned. "What side road shall we take?"

And so we followed the Zumbro River, where a hundred years ago a

doctor in these remote parts had speculated on the nature of epidemic cerebrospinal meningitis. This man, Lee's predecessor in the winding valley, described the lugging ache in the neck, the drawing together of the scapulae, and the absence of stertor. Here some long-silent homes had been taken over by the forest, the little creatures and the earth. The maples flamed and hid the scars of man. Lee was always thoughtful, but not, as now, so pensive.

Two months later he was dead.

Doctor Eaton lived his early years in Illinois, where he attended James Millikin University, the University of Chicago, and Rush Medical College, which in 1932 granted him the degree of Doctor of Medicine. He became a fellow, first in medicine, then in neurology, in the Mayo Foundation for Medical Education and Research, Graduate School, University of Minnesota which, in 1938, granted him the degree of Master of Science in Neurology. July 1, 1936, he was invited to join the staff of the Mayo Clinic as a consultant in neurology. May 19, 1951, he was appointed chairman of the sections of neurology which, under his guidance, grew greatly in size and in prestige. After successive promotions in the graduate school of the university, he was, in 1950, appointed professor of neurology.

In World War II, Dr. Eaton entered the United States Navy but, for physical causes, was compelled to remain on inactive status. He was a member of Nu Sigma Nu, Alpha Omega Alpha and Sigma Xi; an active member of the American Medical Association and, in 1956, chairman of its Section on Nervous and Mental Diseases. He was secretary, and in 1953 president, of the Central Neuropsychiatric Association. He was a member of the American Academy of Neurology and of the Advisory Board of the Myasthenia Gravis Association; a director of the American Board of Psychiatry and Neurology; honorary member of the Association of Electromyography and Electrodiagnosis and, in 1958, president of the Association of Research in Nervous and Mental Disease, which dedicated its most recent program to his memory. He was an active member of the First Universalist Church, Rochester, Minnesota. His diverse interests included photography, horticulture, boating, hunting, fishing and Mississippi lore.

Dr. Eaton was the author of more than fifty published papers on neurological and psychiatric subjects. These concerned the accidental hypodermic transmission of malaria, dementia praecox, herpes zoster, psychotherapy in dermatitis artifacta, peroneal paralysis, meningococcemia, symmetrical calcification of the basal ganglia with parathyroid insufficiency, negative pressure in the epidural space, protein in the cerebrospinal fluid, tumor of the spinal cord, assessment of treatment of neuromuscular ... with vitamins, root pain, myasthenia gravis, orthostatic hypoten- ... treatment of migraine with potassium thiocyanate, treatment

of narcolepsy, basilar invagination, brachial neuritis, use of curare, electromyography, dermatomyositis, treatment of neurological diseases with cortisone, myotonia, epilepsy, pheochromocytoma and tetanus. He was editor of, and contributor to, *Clinical Examinations in Neurology*, which was published as a textbook in 1956. During the last 15 years he became increasingly interested in neuromuscular diseases and in this field won international recognition.

Lee Eaton was first of all a physician. The picture that hung in his office was that of the old doctor resting his chin on the head of a cane. He was a teacher whom every student remembered with pride. He was the trusted counselor of patient, friend and stranger. He did not hoard the prerogatives of originality, but shared them with his colleagues. His stand was generous but never ambiguous. He accepted criticism with humility and equanimity and he offered criticism without offense. There was never a hint of hardness. He was devoted to his family: his wife, the former Mary Louise Long; his children, Mrs. Elizabeth D. Monson, Lynne St. Pierre, Emily Jordan, Charles McKendree and Thomas Lee; one grandson; two brothers, Gilbert H. Large and J. Stuart Eaton, and a sister, Mrs. S. B. Herdman.

HENRY W. WOLTMAN

ANNOUNCEMENT OF MEMORIAL FELLOWSHIP

CHAIRMAN ADAMS: Ladies and gentlemen, at the beginning of this afternoon's session, December 12, 1958, I have the pleasure of announcing the Lee M. Eaton Memorial Fellowship, to be given by the Muscular Dystrophy Association of America. This information was provided by Dr. Milhorat and the officers of this organization. One can hardly think of any action on the part of this Society which would have given greater pleasure to Dr. Eaton.

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Part I

BASIC STRUCTURE AND FUNCTION OF THE MOTOR UNIT

PART V
SOME EXPERIMENTAL TECHNIQUES OF PROMISE IN THE STUDY OF NEUROMUSCULAR DISORDERS

Chapter I

THE GENERAL CONCEPT OF THE MOTOR UNIT[1, 2]

FRITZ BUCHTHAL, M.D.

The topic of this report is the general concept of the motor unit. It seems natural to base discussion of it on the anatomical, mechanical and electrophysiological properties of the lower motor neuron. By virtue of the scope of the problem a review of these features can in many respects only be superficial.

ANATOMICAL AND MECHANICAL FEATURES

The coarse anatomical structure of the muscle and its extension in its habitual length beyond equilibrium length ensure maximum economy with respect to the specific function it subserves:

In the muscles whose main function is *shortening*, the individual muscle fibers have the same length as the whole muscle, and in especially long muscles, the fibers may be arranged in series. The insertion to the tendon extends over a relatively small area (fig. I.1, spindle-shaped muscles). When the main function of the muscle is the development of *tension*, the number of muscle fibers is large as compared to the total muscle volume, larger than is the case in muscles which operate by a great change in length. The relatively smaller volume obtains by the distribution of the tendinous insertion over a large area. Thereby the muscle fibers are shorter than the total length of the muscle (fig. I.1, *e.g.* in bipennate muscles). To produce a given tension a muscle which consists of short fibers requires less energy per gram of muscle than a muscle with long fibers; the tension developed depends on the number of activated muscle fibers rather than on their length. It is a special feature of the muscle machine that its energy expenditure adjusts itself to the amount of work required, the expended energy increasing linearly with the work performed (55).

At its habitual length in the body the length of skeletal muscle is 10 to 20 per cent above its equilibrium length. At this degree of stretch the shortening of the muscle during contraction is maximal and so is the amount of work performed. When kept at a constant length, it also develops its maximum in tension at this degree of stretch (18, 56).

When the length exceeds the resting length of the muscle in the body, the muscle efficiency decreases. Together with the limitation of movement

[1] From the Institute of Neurophysiology, University of Copenhagen, Denmark.

[2] Supported by grants from the Michaelsen Foundation, Copenhagen, the Rockefeller Foundation, New York and the Muscular Dystrophy Associations of America, Inc.

tendon being 600 to 1300 kg. per cm.^{2} (27) as compared with 5.5 kg. per cm.^{2} of the muscle fiber (22). The connective tissue separates the muscle into bundles containing 20 to 60 muscle fibers (100). In the brachial biceps, for example, there are about 15000 of these primary fascicles. Each fascicle contains fibers from 2 to 3 different motor units. This is evident from the fields of atrophic fibers in the primary fascicles in mild atrophy of neurogenic origin. Wohlfart (101) found 10 to 50 fibers per atrophic field, and a recent examination of biopsies from patients with mild amyotrophic lateral sclerosis indicated 10.2 ± 6.7 fibers per atrophic field (15). In the brachial biceps the individual motor unit is represented in about 100 primary fascicles. The distribution of these bundles cannot be determined by histological techniques, but has been measured by means of action potential recordings (see p. 19).

Many of the tasks set to the motor system require not only a certain amount of work but also that the work be performed within a certain period of time. Therefore, a discussion of the efficiency of work must include a consideration of the time factors involved, *i.e.*, the shortening velocity, the rate of release during activity, and the time over which the contraction is maintained. The shortening velocity of a muscle decreases with increasing external load according to the hyperbolic equation formulated by Hill (55). While shortening velocity is maximal in the unloaded muscle, mechanical power (tension times shortening velocity) attains its maximum value when the muscle works against a force of about one-third of that maximally produced at the level of tetanic contractions (18, 57).

With the relationship between shortening velocity and load, the smaller relative load in a small animal than in a large accounts for the relatively faster movements of small animals as compared with large animals. Thus, animals of similar body shape attain a maximum velocity which is independent of body size. The small whippet runs as fast as the one and a half times larger greyhound (60 km. per hour) and as a racing horse (68 km. per hour). The relative load is smaller in small animals because (1) the load against which a muscle operates is proportional to the body weight of the animal and therefore to the *cube* of its linear dimension; and (2) the maximum force is proportional to the physiological cross section of the muscle and therefore to the *square* of its linear dimension. Hence, the relative load is proportional to the linear dimension, *i.e.*, smaller for smaller animals. Since the volume of a muscle is adapted to the load against which it works, similar considerations apply to muscles of different size in the same organism. It is furthermore implied in these considerations that a sequence of contractions can occur with a higher frequency in a small muscle, as for example the muscles of the eye, than in the large extremity muscles.

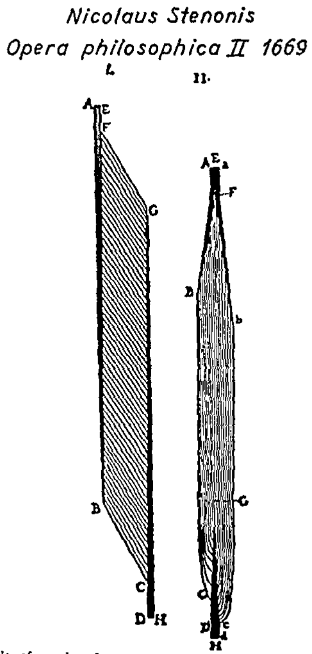


Fig 1.1. Examples of muscles adapted mainly to develop force (*I*, gastrocnemius) and to shorten (*II*, biceps brachii)

given by the joints, the intramuscular connective tissue, which is less compliant than the muscle fiber, limits the possible degree of stretch and keeps mechanical conditions close to optimum. A whole muscle can be stretched by about 50 per cent while an isolated fiber allows 100 per cent of stretch. If the muscle is stretched to its breaking point, rupture occurs in the majority of cases in the muscle belly, the breaking stress of the

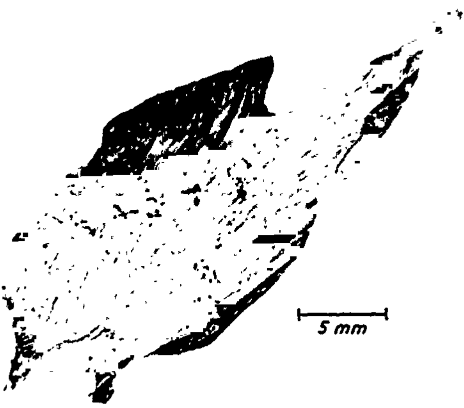


Fig. 1.2. The end-plate zone in the brachial biceps of a stillborn infant. Longitudinal section (100 μ), stained with acetylthiocholinjodid and counterstained with thionine blue. Length of total muscle 40 mm. (25).

end-plate zone extends over only a small fraction of the muscle length. In the brachial biceps the extent of the end-plate zone is about 15 per cent of the fiber length (fig. 1.2). The extent of the end-plate zone in fibers of individual motor units cannot be determined histologically. It can be obtained by measuring the action potentials of a given motor unit in different regions of the muscle and coincides with the extent of the histologically determined end-plate zone of the whole muscle (14). Before entering the end-plate the fine motor nerve branches (1μ diameter) occur as small brushes, each containing an average of 12 fibers (standard deviation is 6 fibers). Presumably they originate from the same axon and innervate muscle fibers within a primary fascicle. These groups of muscle fibers correspond to those seen in patchy atrophy of neurogenic origin (subunits).

The fact that the end-plates are situated around the mid-portion of the muscle fibers ensures the fastest activation of all its contractile material. In the frog and in the cat there is, however, evidence of *multiple innervation* of individual muscle fibers either derived from one branching nerve fiber or from different motor neurons (66). In man there was no evidence of multiple innervation in the superior rectus of the eye, the semitendino-

(B) FILARIASIS : See under filariasis

Skin lesions : obstructive dilatation and varicosity of lymphatics with lymphatic œdema or lymphorrhœa

Sites : (1) Elephantiasis of the scrotum and penis
(2) Elephantiasis of the limbs
(3) Filarial abscesses

(6) OTHER CHRONIC DISEASES OF THE SKIN

(A) GLANDERS : See under Glanders

Skin lesions : (1) **Wound of entrance :** erysipelatoid tumidity and lymphangitis
↓
(2) **Cutaneous lesions :**
(A) **Acute :**
(a) eruptions : papular, vesicular, pustular
(b) ulceration : serpiginous
(c) gangrene : local
(B) **Chronic :** ulcer : indolent, indurated, serpiginous

Diff. diag : any other lesion of the skin
: syphilis, tuberculosis, actinomycosis
: leprosy, anthrax, tropical sore

(B) ACTINOMYCOSIS : See under Actinomycosis

Skin lesions : (a) chronic progressive granulomatous and fibrous **infiltration** of the connective tissues
+
(b) multiple small abscesses → **Sinuses**
+
(c) viscid exudate with **yellow granules**

(C) ANTHRAX : See under anthrax

Skin lesions : (a) Pimple
↓
(b) Papule
↓
(c) Pustule
↓
(d) dry black slough . surrounded by vesicles, surrounded by red indurated œdema

Diff. diag : Boil, septic focus, cellulitis

(D) ELEPHANTIASIS :

Def : A progressive fibrosis and hyperplasia of the dermis and subcutaneous tissues

Nomenclature : (1) **Elephantiasis Nostras :** non-parasitic
(2) **Elephantiasis Arabum :** parasitic

Varieties: (1) **Congenital**: Milroy's disease
- (*a*) simple
- (*b*) familial - hereditary trophœdema

Etio: hereditary maldevelopment of lymph vessels and tissues

Path: dilated lymph spaces
fibrous tissue hyperplasia

(2) **Obstructive**:
- (*a*) removal of lymph glands
- (*b*) cicatricial obliteration of lymphatics
- (*c*) glandular sepsis with abscess

(3) **Infective**:
- (*a*) Filarial
- (*b*) Bilharzial
- (*c*) T. B.
- (*d*) Syphilis
- (*e*) Leprosy
- (*f*) Granulomatous: venereum inguinale

(4) **Malignant**:
- (*a*) Lymph vessels: permeation
- (*b*) Lymph glands: infiltration
  permeation
  embolism
  removal

(5) **Bacterial**: strepto and staphylococcal recurrent lymphangitis and cellulitis (white leg)

(6) **Toxic**: chrysarobin

Compl: (1) Sepsis: Streptococcal lymphangitis or cellulitis
(2) Paralysis

Treat:

(I) **Palliative**:

(1) **Postural**: Elevation

(2) **Elastic Compression**

(3) **Massage**

(4) **Injections**:
- (*a*) anti-streptococcal serum
- (*b*) sulphanilamide group
- (*c*) vaccine therapy
- (*d*) fibrolysin injections
- (*e*) foreign protein therapy
  - (α) T.A.B. Vaccine
  - (β) aolan
  - (γ) whole blood

(5) **Internal medication**: Pot. Iodide

(II) **Operative:**

(1) **Kondoleon:** Elliptical excision of skin, subcutaneous tissues and deep fascia so as to expose the muscles

(2) **Radical excision:** as in penis and scrotum

(3) **Lymphangioplasty:** Silk implantation
Ind: malignant elephantiasis of the upper extremity with no septic complications

IV. ULCERS OF THE SKIN AND SUBCUTANEOUS TISSUES

Def: Breach of surface of the skin or mucous membrane as a result of gradual disintegration

Etiology: (1) **Trauma:**

(2) **Lowered tissue vitality:**
(a) local
(b) general: circulatory, nervous, metabolic

(3) **Sepsis:**

Pathology: varieties:

(1) **Traumatic:**
(a) abrasion
(b) wound
(c) burns

(2) **Circulatory:**
(a) bed sore
(b) varicose
(c) gravitational
(d) anæmic

(3) **Neurogenic:**
(a) bed sore
(b) perforating

(4) **Metabolic:**
(a) diabetic
(b) gouty

(5) **Mechanical:**
(a) too extensive
(b) failure of coaptation of edges
(c) irritation

(6) **Septic:**
after any septic process underneath

(7) **Specific:**
(a) Tuberculosis
(b) Syphilis

(*c*) Soft chancre
(*d*) Leprosy
(*e*) Tropical
(*f*) Glanders
(*g*) Anthrax
(*h*) Actinomycosis

(8) **New growths:**
(*a*) Innocent: (1) Ulcerating cystadenoma
(2) Infected sebaceous cyst
(*b*) Malignant: (1) Carcinoma:
(α) Carcinomatous ulcer
(β) Ulcerating carcinoma
(2) Sarcoma: fungating
(3) Melanoma

Clinical stages:

(A) **Acute or spreading:**

Clinic: surface: slough-covered
edges: extending, inflamed
discharge: copious, dirty
surroundings: inflamed

Treat: (*a*) hypertonic packs, baths or irrigation: saline or mag. sulph
(*b*) complete rest with elevation
(*c*) general & specific treatment

(B) **Transitional:**

Clinic: surface: clean
edges: stationary, moderately inflamed
discharge: minimum, serous
surroundings: moderately inflamed

Treat: mild antiseptic dressings: acriflavine

(C) **Healing:**

Clinic: surface: clean, dry, red granulations
edges: shelving with epithelization
discharge: nil
surroundings: healthy

Treat: (*a*) Emollient non-irritating dressings: vaseline, paraffin
(*b*) Rest: splints and infrequent dressings

(D) **Abnormal: Stationary:**

(*a*) **callous:**
surface: flabby, hyperæmic, raised granulations
base: adherent to underlying structures
edges: hard and raised
discharge: irritant
surroundings: indurated & pigmented

(*b*) **irritable:**
callous ulcer with neuralgic points

(*c*) **anæmic:**
surface: pale, watery, œdematous granulations
surroundings: no inflammation; pale

(*d*) **weak:**
no attempt at healing
no granulations
feeble epithelization

(*e*) **inflamed:**
Pain, tenderness and inflammation: hyperacute

Causes of non-healing abnormal ulcers:

(I) **General:**
(1) Constitutional disturbances: debility
(2) Circulatory disturbances: arteriosclerosis
(3) Neurogenic disturbances: Tabes dorsalis
(4) Metabolic disturbances: Diabetes
(5) Specific disturbances: Syphilis

(II) **Regional:**
(1) Circulatory: varicose veins
(2) Neurogenic: peripheral neuritis

(III) **Local:**
(1) Mechanical: friction, movement, displacement of epithelium
(2) Anatomical: adherence to deeper structures, rigidity of surroundings
(3) Physiological. circulatory inefficiency due to fibrosis or too large surface
(4) Chemical. too strong or too long irritant antiseptics
(5) Specific: T. B; actinomycosis; tropical; sore
(6) Neoplastic

Treatment of abnormal ulcers:

(1) **Treat the cause:** general; regional; local
(2) **Local treatment:** applications:

(*a*) **Callous:** (α) Occasional cauterzation: A_gNO_3, or C_uSO_4
↓
(β) Dressings;
(1) hypertonic
↓
(2) mild antiseptic
↓
(3) emollient

(*b*) **Weak and Anæmic:**
Stimulant dressings: Scarlet red
Unna's plaster,
Friar's balsam

(3) **Regional treatment:**
- (1) Rest by plasters and splints in callous irritated ulcers
- (2) Bier's hyperæmia and massage in weak and anæmic ulcers

(4) **General treatment:**
- (1) Tonics:
- (2) Specific:

(5) **Operative treatment:**

Ind: (1) Neoplastic ulcers
(2) Ulcers with elephantiasis
(3) Very extensive ulcers
(4) Failure of conservative treatment
(5) Ulcers near joints
(6) Recurrences after healing

Tech: (1) **Bipping and plastering**
(2) **Scraping**
(3) **Excision**
(4) **Skin-grafting**
(5) **Nerve stretching**
(6) **Sympathectomy:**
(*a*) Periarterial
(*b*) Central

SOME SPECIAL ULCERS:

(1) BURNS ULCER:

Etio: Burns: (*a*) Thermal
(*b*) Chemical: accidental applications
ill-placed injections
(c) Radium & X-Rays

Path: (*a*) Third degree: thin, white, supple, papery scar
(*b*) Fourth degree: irregular scars with keloids and contractures

Special compl: (*a*) Non-healing
(*b*) Fibrosis and its sequelæ
(*c*) Discoloration and deformity

Special treat: (*a*) Tannic acid: healing under scab
(*b*) Emollient infrequent dressings of raw areas
(*c*) Preventive splintage
(*d*) early skin-grafting

(2) PRESSURE SORES: Bed sores, splint sores, plaster sores

Def: Gangrenous non-inflammatory spreading ulcer due to necrosis of the skin and subcutaneous tissues

Etio: (1) **Predisposers:**
(1) chronic exhausting diseases
(2) circulatory inefficiency
(3) nervous inefficiency

(C) **Moderate ulcer:**

Etio: Failure of deep veins: white leg
Clinic: Area more than four square inches
Treat: (1) Pull the edges together by sticking plaster
(2) Elastoplast strapping from toes to knee (change every 4th → 7th → 14th day)
(3) Injection treatment of varicosities
After-treat. Firm crepe bandage: elastic stockings

(D) **Indurated ulcer:**

Clinic: Much induration with solid œdema
Treat. Tightest possible elastic bandage

(E) **Malleolar ulcer:** Irritable ulcer

Etio: Femoral vein thrombosis
Site: Malleolar sulcus
Clinic: Irritable and painful
Treat. (1) Aspirin or Percain dusting
↓
(2) Pull together the edges with adhesive plaster
↓
(3) Adhesive felt
↓
(4) Dunlopillo-sorbo pad
↓
(5) Elastoplast bandage from toes to knee

(F) **Eczematous ulcer:**

Clinic. Chronic ulcer surrounded by eczema
Treat: (1) Apply: (*a*) Ung. bismuth et Quinoline
or
(*b*) Coal tar. drachm one
Zinc oxide: drachm one
Lanoline and Vaseline: ad oz. one
(2) Elastoplast bandage: over the ointment

(G) **Extensive ulcer:**

Clinic: Area 10 square inches and more with much œdema
Treat: (1) Rest, elevation and firm bandage
(2) Injection treatment of varicose veins
(3) Skin-grafting: Reverdin method.
(4) Elastic stockings

(4) PERFORATING ULCER:

Etio: Nervous disease: central, spinal, peripheral
Site: (*a*) Plantar side of first metatarsal head: Tabes
(*b*) Radial side of second metacarpal: syringomyelia
Clinic: (*a*) **Sinus** with cornified epithelium leading to bone
(*b*) Absolute **painlessness**

(c) Sensory disturbances in the surrounding area
(d) Signs of underlying nervous disease
(e) Sometimes maggots

Treat: (a) Antisepetic dressings
(b) Periarterial sympathectomy + scraping
(c) Nerve stretching

(5) OSTEOMYELITIC ULCER:

Etio: Underlying bone sepsis: unhealing ulcer after:
(a) Separation of gangrenous part
(b) Drainage of osteomyelitis
(c) Amputation

Clinic: (a) Indolent callous ulcer } leading to necrosed bone
(b) Sinus }
(c) Irritant discharge

Compl: (a) Non-healing
(b) Dermatitis
(c) Epithelioma

Treat: Scraping or excision of the bone

(6) DIABETIC ULCER:

Etio: Diabetes: (a) Following gangrene
(b) Following trauma with sepsis

Path: Factors: (a) Circulatory disturbances
(b) Neuritis
(c) Lowered tissue vitality

Clinic: Non-healing chronic callous ulcer after:
(a) Separation of gangrenous part
(b) Septic trauma

Treat: (1) **General**: Anti-diabetic: Dietetic, Insulin
(2) **Local**:
(a) Conservative: Dressings
(b) Operative:
(1) *Scrapings*
(2) Periarterial sympathectomy
\+
Vein ligature
(3) Amputation

(7) MECHANICAL ULCER:

Etiological Treatment
(a) Too extensive: Skin-grafting
(b) Adhesion: Excision + skin-grafting
(c) Failed coaptation: Buried sutures
(d) Faulty dressings: (1) Avoid epithelial displacement
(2) Avoid too strong antiseptics
(3) Avoid friction and movement
(4) Avoid moisture

(8) SPECIFIC ULCER: See under respective diseases of the skin

(9) NEOPLASTIC ULCER: See under new growths of the skin

(10) DIPHTHEROID ULCER: (Med. Annual 1938)

Clinic: (*a*) **Necrotic pustule**
↓
(*b*) Superficial rapidly **extending ulcer**
- (1) Red, œdematous surroundings
- (2) Bluish red swollen edges
- (3) Thick, adherent slough
- (4) Bright red granulating surface
- (5) Seropurulent discharge

↓
(*c*) **Verrucose scar**

Path: Diphtheroid organisms

Treat: (*a*) Autogenous vaccine
(*b*) Local application of Permyase

V. SINUSES AND FISTULAE OF THE SKIN

Def: **Sinus:** A narrow track lined with granulations, opening on a surface at one end, the second end ending *blindly* in a septic focus

Fistula: An abnormal communication lined by granulations between two cavities or between a cavity and a surface

Etiology: (1) **Mechanical:**
- (*a*) Persistent cavity · empyema, bursæ
- (*b*) Adhesion to bones: suprapubic
- (*c*) Absence of raw surface on apposing walls
- (*d*) Surrounding fibrosis:
- (*e*) Absence of rest:
- (*f*) Distal obstruction:

(2) **Chemical:** Irritant discharges:

(3) **Infective:**
- (*a*) Continued sepsis: osteomyelitis
- (*b*) Septic foreign body:
  - (α) Auto: sequestrum
  - (β) Hetero: foreign body
- (*c*) Faulty treatment: bad drainage

(4) **Specific:**
- (*a*) T. B.
- (*b*) Mycetoma
- (*c*) Actinomycosis
- (*d*) Schistosomiasis

(5) **New growth:**
- (a) Direct infiltration: fungation
- (b) Sepsis
- (c) Distal obstruction: fæcal fistulæ

(6) **Congenital:**
- (a) Cervical sinus
- (b) Sub-mental or mental sinus
- (c) Post-anal and sacral sinus
- (d) Urinary or fæcal fistulæ

(7) **Ulcerative:**
- (a) Perforating ulcer
- (b) bed sore

Diagnosis: (1) **Examination of the discharge:** Clinical, chemical, microscopical

(2) **Probing:** depth, direction, base

(3) **Injection of dyes:** in fistulæ in ano

(4) **X-Rays:** Plain and after lipiodol

(5) **Scraping:** and microscopical examination

(6) **Biopsy**

Treat: (1) **Treatment of underlying cause:** local, regional, general

(2) **Local:**
- (a) Winnet orr: BIPP and plaster
- (b) Scraping and BIPP
- (c) Incision, scraping and drainage
- (d) Excision in toto
- (e) Dependent drainage of underlying septic focus
- (f) Short circuit

(3) **Regional:** Protect the surrounding skin by:
- (a) Emollient applications
- (b) Anti-chemical applications

VI. NEW GROWTHS OF THE SKIN AND SUBCUTANEOUS TISSUES

(1) CYSTS:

(A) RETENTION CYSTS:

Sebaceous Cyst:

Def: Retention cyst due to obstruction to the mouth of a sebaceous duct or a hair follicle

Sites: Face, scalp, scrotum: Not on palms and soles

Clinic: Subcutaneous globular swelling of varying consistency, adherent to the skin at one black spot

Compl: (*a*) Infection
(*b*) Ulceration: Cock's peculiar tumour
(*c*) Sebaceous horn
(*d*) Calcification
(*e*) *Malignancy*

Treat: (1) Transfixion and excision
(2) Dissection and excision

(B) EXUDATION CYST:

(*a*) Lymph cyst
(*b*) Blood cyst

(C) DERMOID CYST:

Def: Congenital cyst from a rudiment of a surface epithelium, which has remained included in deeper tissues or from a vestigial epithelium-lined structure

Path: Source: Epiblast buried in mesoblast

Varieties. (*a*) Implantation dermoid: Traumatic
(*b*) Sequestration dermoid: Congenital
(*c*) Tubulo-dermoid: Vestigial

Morb. anat: (*a*) Wall: fibrous
(*b*) Lining. Squamous
(*c*) Contents: Sebaceous

Sites. Surface-joint line

(A) **Sequestration:**

(1) **Head and Neck:**

(A) **Face:**
(*a*) Outer angle orbit
(*b*) Inner angle orbit
(*c*) Naso-facial sulcus
(*d*) *Oro-auditory sulcus*
(*e*) Nasal root

(B) **Scalp:**
(*a*) Ext. occipital protuberance
(*b*) *Ant. fontanelle*
(*c*) Midline

(C) **External Ear**

(D) **Mastoid**

(E) **Neck:**
(*a*) Midline
(*b*) Lateral: branchial

(2) **Trunk:** Midline: anterior and posterior

(B) **Implantation:** Post-traumatic epidermoid cyst

(1) **Hand:** Palmar surface of fingers
(2) **Eyes:** Iris and cornea

Compl: (1) **Infection**: Inflammation, suppuration, ulceration
(2) Malignancy
Clinic: (1) Purely subcutaneous non-adherent cyst
(2) **Special site**
Treat: Excision

Differential Diagnosis of subcutaneous cystic swellings:
(1) Sebaceous cyst
(2) Cold abscess
(3) Dermoid cyst
(4) Ganglion
(5) Bursitis
(6) Meningocele
(7) Aneurysm
(8) Lymph cyst
(9) Blood cyst
(10) Liquefying gumma
(11) Encysted lipoma, fibroma or angioma

(2) GROWTHS OF THE SKIN AND SUBCUTANEOUS TISSUES

(A) INNOCENT GROWTHS OF THE SKIN AND SUBCUTANEOUS TISSUES:

(1) PAPILLOMA:

(a) Warts:

Hypertrophied skin papillæ covered by an overgrowth of epidermis

(α) Flat warts:

Etio: Contagious infection due to filter passing virus
Sites: Hands, forearms, face, soles
Clinic: Multiple crops
Treat: (a) 10% salicylic acid collodion
(b) Glacial acetic acid
(c) Fuming nitric acid
(d) X-Rays
(e) Radium
(f) Carbon dioxide snow
(g) Scraping & iodine dressing

(β) Pedunculated warts:

Etio: Irritation: irritating discharges
Site: Genitals
Treat: (a) Dry cleaning: zinc boric powder
(b) Cautery
(c) X-Rays
(d) Radium

Sites: neck, abdominal wall, muscles
Compl: (a) Ventral hernia
(b) Loss of action of a muscle
(c) Deformity

(9) MALIGNANT SCAR: Marjolin's epitheliomatous ulcer
Path: Epithelioma in a scar
Clinic: Carcinomatous ulcer with:
(a) slow growth
(b) no pain
(c) no glands
Treat: (1) Free excision and skin-graft
(2) Amputation

VIII. AFFECTIONS OF THE NAILS

(I) TRAUMA:

(1) CONTUSION:

Etio: crushes
Clinic: painful discoloration
Compl: (a) sepsis
(b) separation of the nail
(c) fracture phalanx
Treat: (1) Conservative. Cold compresses
(2) Evacuation of the subungual hæmatoma

(2) AVULSION:

Clinic: extreme pain due to exposure of the sensitive nail matrix

(3) FOREIGN BODIES:

Etio: needles, thorns, wood chips
Compl. sepsis
Treat: removal

(II) INFLAMMATION:

(A) ACUTE:

(1) **Onychia:** (See infections of the hand)
(2) **Paronychia:** (See infections of the hand)

(B) CHRONIC:

(1) **Syphilis:** (See infections of the hand)
(a) Primary chancre
(b) Secondary onychia and paronychia
(c) Congenital syphilitic onychia
(2) **T. B.:** (See chronic affections of the hand)
(3) **Ingrowing toe nail:** (See foot ulcers)

(III) GROWTHS:

(1) Subungual exostosis:

Painful displacement of the nail due to growing exostosis from the last phalanx of the great toe (See under foot).

(2) Melanotic whitlow:

(See under skin and melanoma).

IX. PLASTIC OPERATIONS OF THE SKIN AND SUBCUTANEOUS TISSUES

Aims: (1) Shortening the period of and aiding the surface healing
(2) Cosmetic
(3) Prevention and treatment of abnormal scar
(4) Restoration of function

Indications:

(1) **Burns:**
 (a) primary: failure of healing
 (b) secondary: abnormal scar

(2) **Malignancy:** defects after radical excision
 (a) primary
 (b) secondary

(3) **Trauma:** Skinning of scalp or scrotum

(4) **Sepsis:** Chronic large ulcers

Pre-operative considerations:

(A) **Local:**
 (1) Quantity of tissues lost
 (2) Character of the tissues lost
 (3) Shape of the tissues lost
 (4) Dimensions of the tissues lost
 (5) Site from where the graft can be taken
 (6) Nature of the graft
 (7) Method of transference of the graft

(B) **Regional:**
 Adaptation and fixation of the recipient and donor area to each other

(C) **General:**
 (a) good general health
 (b) absence of metabolic and specific diseases

Pre-operative preparation:

(1) Render the area devoid of sepsis and inflammation
(2) Non-irritant dressings for a week previous
(3) Pre-operative adaptation of donor area to recipient area
(4) Non-irritant preparation of both the areas

Operative technic :

(1) Site of the graft :
  (a) similarity of skin
  (b) availability with ease
  (c) good circulation
  (d) concealed position
  (e) no local sepsis
(2) Incisions . clean incisions to follow tension lines and natural creases and preserving blood supply
(3) Removal of the granulations from recipient area
(4) Minimum and delicate handling of tissues
(5) Perfect hæmostasis
(6) Avoidance of tension
(7) Close apposition of the graft to the recipient area
(8) Sutures
  (a) deep · fine catgut
  (b) subcuticular : in ear, face, eyelids
  (c) skin fine silkwormgut

Post-operative management :

(1) closed dressings
(2) open method

(1) SKIN-GRAFTS :

Ind. · (1) Large burn ulcers
(2) Large chronic ulcers
(3) Extensive wounds
(4) Excisional defects

(A) RAZOR GRAFTS :

(1) Thiersch's Epidermic Graft

(2) Intermediate Graft

Sites · Thigh : outer aspect
arm . inner aspect
abdomen · lateral aspect

Depth : dead white tissue with punctiform bleeding points

Tech . two stage :

(A) Donor area :
  (a) preparation . wash with saline
  ↓
  methylated spirit
  ↓
  alcohol
  (b) Cutting the graft :
    (1) keep the razor wet or paraffined
    (2) tension on the region by wood strips
    (3) sawing movements parallel to surface

(*c*) preservation of the graft: in warm saline
(*d*) dressings: sterilized vaseline

(B) Recipient area:
(*a*) removal of granulations
(*b*) wash with warm saline
(*c*) spread out the grafts: overlapping margins

Dressings: (1) open gauze with vaseline + 1 % balsam of peru
↓
(2) gauze with flavine and paraffin
↓
(3) steriled rubber sponge
↓
(4) adhesive straps or crepe bandage
↓
(5) splinting

After-treatment:
(1) Closed period: ten days
: leave alone
↓
(2) Change period: one week to fortnight
: dressings every two days
↓
(3) Grease massage: after healing
: massage by liquid paraffin

Special area for Thiersch:
(1) Eyes:
(*a*) ectropion
(*b*) symblepheron
(*c*) socket
(2) Nose:
(*a*) syphylitic destruction
(*b*) atresia
(3) Mouth:
(*a*) lip ectropion
(*b*) soft tissue trismus
(*c*) flat lip
(4) Extremities:
(*a*) Traumatic scars
(*b*) Burns
(*c*) Dupuytren's contracture
(5) General:
(*a*) any skin area
(*b*) stenson's duct
(*c*) urethral defects

(B) PINCH GRAFTS: REVERDIN'S OR DAVIS'

Ind: (*a*) very large granulating areas
(*b*) fixation and immobilization not dependable
(*c*) cosmetic appearance not important

Tech : (*a*) pick up pinches of skin with needles
(*b*) snip off with scissors or scalpel
(*c*) place half an inch from one another
(*d*) removal of granulation not required

Dressings : as in Thiersch

(C) WHOLE THICKNESS GRAFTS: WOLFE-KRAUSE

Whole skin down to but not including the subcutaneous fat
(*a*) non-hairy
(*b*) hairy

Tech. (A) Recipient
- (*a*) free excision of the area
- (*b*) perfect hæmostasis
- (*c*) determine the size and pattern of the defect

(B) Donor.
- (*a*) cut the graft precisely equal to the recipient
- (*b*) snip off the subcutaneous tissues
- (*c*) *close the raw area by* ·
  - (1) sutures
  - or
  - (2) Thiersch

(C) Transfer. place the graft on recipient area and suture the edges

Dress · Same as in other grafts
Pressure dressings: Sterile rubber sponge with elastoplast
Splinting of adjoining joints
Change after seven days

Complications of skin-grafts :
- (*a*) Sepsis and suppuration
- (*b*) Death of the grafts
- (*c*) Displacement of the grafts by :
  - (1) friction
  - (2) movements
  - (3) rough dressings
- (*d*) Failure of grafts to take

(2) SKIN FLAPS: PEDICLED GRAFTS composed of skin and subcutaneous tissues

Parts. (1) Circulatory. Base
(2) Plastic

Varieties : (1) **Advancement or sliding flap**
Tech : Approximation of undermined edges
Ind : Scalp, breast, moles

(2) **Rotation flap:**
Tech : Rotation with broad base

(3) **Transposed flap:**
Tech: Long axis of the flap at right angles to the long axis of the defect
Ind: mouth and cheek

(4) **Bridged or Pedicled flap**
Ind: Nose, cheek, face
Variet: (*a*) ordinary pedicled
(*b*) arterial pedicled
(*c*) **tubed pedicled: Gillies**

Indications: (1) Burns or extensive raw surface on face
(2) Distant flaps

Tech: (1) First stage:
(*a*) Raise skin strip 3 inches broad with both ends attached
(*b*) Appose the laterel edges of the strip

(2) Second stage: 3 weeks later
(*a*) separation of lower end
(*b*) transfer to upper level

(3) Third stage: 3 weeks later
(*a*) separation of the upper end
(*b*) suture to the margins of the defect

(4) Final stage: 3 weeks later
(*a*) separation of the lower end
(*b*) suture to the remaining margin

Essentials: (1) good circulation
(2) good approximation
(3) no buttonholing
(4) no tension: (*a*) flap larger than recipient
(*b*) use of tension sutures
(5) asepsis

IMPORTANT POINTS

(1) **Trauma**

(A) Difference between contusion and hæmatoma
(B) Wounds:

(*a*) Punctured wounds are most dangerous
(*b*) Treatment of a puncture is immediate expression of blood
(*c*) Medico-legal aspect of blunt scalp injuries which resemble incised wounds
(*d*) Chief considerations about a wound:
(α) Is it aseptic?
(β) Is it potentially septic?
(γ) Is it frankly septic?

(e) Treatment of wounds:
  (1) Aseptic: disinfection and closure
  (2) Potentially septic: Debridement and closure *with temporary drainage*
  (3) Septic: Debridement and mag. sulph pack with drainage
  (4) Established sepsis. Carrel Dakin

(f) Cod-liver oil treatment of wounds:
  Ind: (1) fresh wounds
  (2) burns of second and third degrees
  (3) granulating wounds

(g) Frequent dressings of granulating wounds delay and prevent healing

(2) **Staphylococcal infections** of the skin and subcutaneous tissues

(a) Sulphanilamide group of drugs have definite value in strepto and staphylococcal diseases of the skin

(b) Staphylococcal toxoid is very good in recurrent and resistant furunculosis, styes and carbuncles

(c) Never incise a boil, never squeeze it

(d) Signs of carbuncle
  (α) diffuse induration
  (β) induration with multiple softenings
  (γ) induration with sieve-like openings

(e) Greatest dangers of carbuncle.
  (α) Coma
  (β) Pyæmia

(f) In carbuncle, examine every urine specimen
  (α) sudden disappearance of sugar from urine
    (1) ? Hypoglycæmia
    (2) ? Acetonuria
  (β) Look for Acetone every day

(3) **Streptococcal infections** of the skin:

(a) Wide-spread inflammation of skin and subcutaneous tissues
  ? Erysipelas
  ? Lymphangitis
  ? Cellulitis
  ? Deep acute abscess
  ? Irritant applications
  ? Insect bites

(b) Erysipelas.
  (1) Erysipelas in new born is insidious, starts in infraumbilical region and is invariably fatal

(2) Prognosis is worst under 4 months and over 60 years
(3) Condition of liver is a potent factor in prognosis
(4) Erysipelas of the face has better prognosis
(5) Erysipelas of the head is commoner than all other positions put together
(6) Lupus patients show increased susceptibility to erysipelas

(c) Main causes of Retroperitoneal cellulitis
(1) Extraperitoneal perforations
(2) Acute pancreatitis
(3) Retroperitoneal appendicitis
(4) Extravasation of urine

(d) Main causes of Pelvic cellulitis
(1) Extravasation of urine
(2) Genital tears

(e) Rob's treatment of cellulitis
(α) Adhesive elastic bandage applied so as to cover generously the part involved, limb being encircled completely
(β) Splint or sling for 4–7 days
(γ) Palpation of the part through the bandage
(δ) If no pain or fluctuation, bandage left on for one week more

(f) Ideal dressings for all forms of tissue sepsis is undoubtedly the adhesive elastic bandage

(4) **Irritation of the Skin :**

(a) Emollient and chemical treatment of surrounding skin in irritant discharges
(1) Salivary fistula
(2) Gastric fistula
(3) Duodenal fistula
(4) Intestinal fistula
(5) Biliary fistula
(6) Urinary fistula
(7) Acrid irritating pus

(b) Do not use Cyanide gauze with iodine paint
Do not paint Iodine to the scrotum

(5) **Sepsis :**

(a) Sepsis scalp or face . Intracranial complications
(b) Sepsis throat or neck Œdema of the glottis

(6) **Burns :**

(a) Wilson's clinical phases of burns :
(1) Initial shock : Nervous
(2) Secondary shock : Blood Concentration
(3) Acute toxæmia : Non-specific toxins

(4) Septic toxæmia: Bacterial toxins
(5) Healing

(b) Treatment of:
(1) Initial shock: Morphia and heat
(2) Secondary shock:
(a) Local coagulation treatment
(b) Intravenous saline with glucose or blood plasma
(c) Eucortone (Allen & Hanbury) 2 c.cs. every hour

(c) Coagulation treatment: Tannic acid 2.5 – 10 % sol.
(1) Davidson (a) paint:
(b) pack.
(c) spray:
(d) bath: (Well)
(2) Bettman: Tannic acid + Silver nitrate
(3) Coan (a) Paint of Tr. Ferri perchlor
↓
(b) Spray of:

Tr. Ferri perchlor	15	parts
Sodii Hydroxide	.3	"
Aqua Dist.	30	"

(d) Antiseptics used with Tannic acid treatment
(1) Acriflavine 1–1000
(2) Triple dye { gentian violet. 10% ; brilliant green 1 in 2000 ; acriflavine: 1 in 1000 }
(3) Dettol 20% (Cruickshank)
(4) Mercury Perchloride: 1 in 2000

(e) Other treatments of Burns
(1) Turner. 2% aqueous sol. of mercurochrome
(2) Lohr Lint soaked in cod-liver oil
(3) Normal Horse Serum sprays twice daily

(f) Tannic acid should not be used if fat is exposed, as no tanning takes place

(g) Do not use tannic acid on hands and fingers
Protect eyes in tannic acid treatment of facial burns.

(h) 5% tannic acid: { (α) 5 teaspoonfuls of tannic acid powder to a glassful of water ; (β) 220 grs. to 10 ounces of water }

(7) **Ulcers:**

(a) Ulcer on the face. ? Lupus
? Rodent
? Epithelioma
? Syphilis
? Leprosy

(b) Any indolent unhealing ulcer or abrasion on any part of the body especially lips, tongue, breast and fingers: Do not forget syphilis

(c) Small ulcer with a pin point opening in the middle near about ankle joint
? Guinea worm

(d) Treatment of ulcers:
(1) Spreading stage: Hypertoinc dressings
(2) Transitional stage: Mild antiseptic dressings
(3) Healing stage. Emollient dressings
(4) Non-healing stage:
(a) Treat the general condition
(b) Treat the regional condition
(c) Treat the local condition
(d) Dressings:
weak ulcer: Scarlet red
Proud ulcer: Cauterization

(e) Applications for a pressure sore:
Zinc oxide or Zinc sulph
Scarlet red
Silver nitrate
Tannic acid
Ichthyol
Flavine in Castor oil
Cod-liver oil

(f) Always look out for bed sores in every debililated bed ridden or paralytic patient. Prevention is better than cure

(g) Elastoplast strapping is an ideal treatment for
(a) Varicose ulcers
(b) Chronic leg ulcers
(c) Bed sores

(h) Ideal treatment of a bed sore is complete covering by two layers of elastoplast, which should be left on till healing is complete

(i) Lupus: X-Ray and Radium give transient benefit and result in disfigurement, telangiectasis, irregular pigmentation and ulceration

(8) **Sinuses and Fistulæ:**

Causes: (1) Chronic septic focus: bone
(2) Specific infection: T. B.
(3) Distal obstruction: Urethral
(4) Malignancy
(5) Congenital

(9) **New growths:**

(a) Infected or self-treated warts and corns in elderly people may be a primary focus in:

(1) Diabetic gangrene
(2) Senile gangrene

Some useful paints for wart & molluscum contagiosum

(1) Zinc chloride: drachm ½
Salicylic acid collodion (1 in 10): to oz. 1

(2) Phenol 10 parts
Glacial acetic acid 10 parts
Salicylic acid 10 parts
Strong Tr. Iodine 20 parts
Industrial spirit to 100 parts

(*b*) Melanoma malignum is one of the most malignant tumours
Black streaks and thrombosed veins running up the limb from a small focus on the fingers or toes: ? Melanoma malignum

(*c*) Skin carcinoma without gland affection:
(1) Warty epithelioma
(2) Rodent ulcer
(3) Marjolin's ulcer (scar carcinoma)

(*d*) Treatment of Cancerous and Pre-cancerous dermatoses
(1) Radium
(2) X-Rays
(3) Diathermy (*a*) cutting current
(*b*) electro-dessication
(*c*) electro-coagulation
(4) Cautery
(5) Electrolysis
(6) Carbon dioxide snow
(7) Curettage
(8) Surgical excision

(*e*) In man, exposure to ultra-violet light plays an important part in the etiology of carcinoma of the skin

(10) **Filarial Elephantiasis:**

Bowesman's Glycerine treatment.
Intra-arterial or *Intravenous* (*Femoral*) *injections* of 2–3 c.cs. of 10% sterile glycerine in water once every week

(11) **Scars:**

(*a*) Cheloid: ? Is it local or is there a general cheloid diathesis?
(*b*) Early massage and mobilization of a scar over the deeper structures is essential to avoid adhesions
(*c*) Proper splintage is essential to avoid contractures
(*d*) Avoid friction of and tension on a scar for at least six months

(12) **Nails:**

(*a*) Colour of the nails is important in:
(1) Blood conditions: hæmorrhage, anæmia
(2) Plasters, bandages, splints: cyanosis
(3) Anæsthesia: cyanosis
(4) Chronic respiratory diseases

(*b*) Indolent ulcer or paronychia
? Chancre
? Ingrowing toe nail
? Melanotic whitlow
? Leprosy

(13) **Skin-grafting:**

(*a*) Post-operative treatment principles:
(1) no irritant dressings
(2) absolute fixation with no friction
(3) uniform pressure:
(*a*) elastoplast
(*b*) crepe bandage
(*c*) rubber sponge.
boiled in saline and squeezed into dry towel; applied to gauze covered graft with elestoplast under slight tension
(*d*) rubber air bags
(4) Immediate dressings. open mesh non-sticking
(5) Delicate change of dressings
(6) Splinting

(*b*) Dressing methods after skin-grafting
(1) Pressure dressings:
(2) Closed non-pressure dressings.
(3) Semi-closed dressings covering: dressings not in contact of the area but fixed to proximal and distal pads
(4) Open dressings. cradle

(*c*) Treatment stages
(1) Closed period one week
(2) Change period. one week
(3) Grease massage period

(*d*) (1) Thiersch: Treatment of Donor area precedes that of Recipient
(2) Wolfe. Treatment of Recipient area precedes that of Donor

The treatment of the Recipient and the Donor areas must be separate from each other

(*e*) Wolfe's grafts are most successful when recipient area is backed up by a bone

(*f*) Pedicled flaps and Wolfe grafts are unsatisfactory over a granulating surface

(*g*) Use of collodion half on the edge of the Thiersch graft and half on the surrounding skin to keep the graft in place

(*h*) Dressings for the donor area after Thiersch

- (*a*) Sterile vaseline or paraffin or Cod-liver oil
- (*b*) Tannic acid treatment

(*i*) Essentials of successful skin-graft

- (1) absence of sepsis
- (2) absence of tension
- (3) perfect apposition of surfaces
- (4) absence of friction

(*j*) The dressings in direct contact with Thiersch or Reverdin grafts must be perforated and non-sticky

(*k*) Points to be remembered in Reverdin:

- (1) granulations must be healthy
- (2) grafts of full thickness in the centre and of not more than ·5 cm in diameter
- (3) interval of ·5 cm. between each graft
- (4) immobilization and pressure

CHAPTER II

THE MUSCLES, TENDONS AND APONEUROSES

I. CONGENITAL

(1) ABSENCE:

(*a*) Pectoralis: in association with **amastia**
(*b*) Shoulder muscles: **Sprengel's shoulder**

(2) MYOBLASTOSIS:

Path: Congenital arrest of development → fibrosis, ossification or fatty degeneration of muscles
Considered to be primary cause of many congenital deformities such as
(*a*) Congenital tibial kyphosis
(*b*) Sprengel's shoulder
(*c*) Myodystrophia fœtalis deformans

II. TRAUMA

(I) CONTUSION:

Etio: strains and blows
Clinic: (*a*) painful function
(*b*) irregular tremors
(*c*) effusional swelling
Diff. diag: (*a*) sprain of a joint
(*b*) subcutaneous contusion
Compl: (*a*) blood borne suppuration
(*b*) fibrotic adhesions
(*c*) pathological rupture (fraying of tendon)
Treat: (*a*) relaxation + cold applications
↓
(*b*) massage and movements

(II) RUPTURE:

Etio: (A) **Traumatic:** (*a*) strain
(*b*) open wounds
(*c*) fractures and dislocations
(B) **Pathological:** Osteoarthritis
Tabes dorsalis
Sites: (*a*) junction of the belly and the tendon
(*b*) avulsion of the tendon with its bony insertion
(*c*) avulsion of the tendon from its bony insertion
(*d*) avulsion of the origin

Clinic: (*a*) sudden painful rupture
(*b*) loss of function
(*c*) two swellings with an intervening gap
Compl: (*a*) fibrosis: with
(1) passive stretching
(2) contracture
(3) adhesions
(*b*) myositis ossificans
Sequelæ. (*a*) painful function
(*b*) loss of function

Muscles affected:

(1) STERNOMASTOID:

Etio: **birth** injuries
Clinic. local discolouration and effusion
Compl: **sternomastoid tumour → torticollis**
Treat: rest and cold applications

(2) SUPRASPINATOUS:

(A) Acute traumatic rupture

Etio: falls on outstretched hand
dislocation shoulder
Clinic. (*a*) active abduction lost
(*b*) passive abduction painless
(*c*) tenderness over greater tuberosity
Treat. **Suture or fixation** of the avulsed tendon to the tuberosity by fascial graft
Tech (1) incision over the shoulder top
(2) division of acromion
(3) exposure of the joint

(B) Chronic friction tendinitis:

Etio: Shoulder labourers
Clinic: (*a*) local tenderness
(*b*) painful abduction between 60°—120°
Treat (*a*) **Leriche:** local injection of 10—20 c.cs. of 20% novocain
(*b*) Diathermy

(C) Tendon calcification:

Etio. chronic osteoarthritis shoulder
Clinic: painful abduction
Diag: X-Ray
Treat: (*a*) Physiotherapy
(*b*) Leriche: novocain injection
(*c*) Excision

(3) BICEPS BRACHII: LONG HEAD

Etio: (*a*) trauma. heavy weights; falling objects
(*b*) pathological: osteoarthritis shoulder

Sites : (*a*) intra-articular
(*b*) tendo-muscular junction
Clinic : (*a*) painful and weak flexion and supination
(*b*) on flexion of the forearm :
(1) soft swelling just above the elbow
(2) hollow in front of upper arm
Treat : Operative suture
Tech : Incision over ant. ⅓rd of deltoid
Exposure of bicipital groove
Suture of long head to short head, or
To Humerus in Bicipital groove
After-treat : Fixation
Method : Plaster of Paris
Position . Arm : adduction
Forearm : across the chest
Time : 6 weeks

(4) TENNIS ELBOW : Common extensor origin or deep head of pronator

Def : Pain and tenderness below the external humeral epicondyle, unaccompanied by any joint abnormality in tennis players

Etio : **'Top Spin'** pronation

Path : (*a*) **tears of extensor** origin or deep head of pronator
(*b*) **periostitis :** traumatic
(*c*) **trauma to radiohumeral ligament**
(*d*) **bursitis : traumatic**
Clinic : (*a*) painful inability to pronate and extend the forearm
(*b*) Tenderness :
(α) antecubital
(β) below the external humeral epicondyle

Diag : **Pain in the area on palmar flexion of tight fist with elbow in extension relieved by dorsiflexion**

Treat : (1) **Preventive :**
(*a*) stop the game
(*b*) treat any septic focus
(2) **Conservative :**
(*a*) Rest : (α) cock up splint
(β) elastic strapping
(*b*) Diathermy
(*c*) Faradism
(3) **Manipulative :**
Ind : (*a*) patient anxious to resume game
(*b*) impediment to full extension

Tech: **'Extension with adduction elbow'**
: with or without anæsthesia

(4) **Operative:**
(a) Splitting of common extensor origin over the radio-humeral joint
(b) Excision of bursa

(5) EXTENSOR LONGUS POLLICIS:

Etio: (a) **Colles's fracture**
(b) Posterior marginal fracture of the radius
(c) Occupational. **'drummer's thumb'**

Path: Spontaneous rupture due to fraying

Time. 8–10 weeks after the fracture

Clinic. (1) 'Sprain of the wrist': (marginal fracture)
↓ (2) inability to extend the thumb + failure of the tendon to stand out

Treat. (1) **Transplant:** Extensor Carpi radialis longus or brevis
(2) **Graft:** Extensor Carpi radialis
Palmaris longus

After-treat: (a) Immobilization
Method plaster of Paris
Extent elbow to thumb
Position: thumb: extension and abduction
wrist. dorsiflexion
Time: six weeks
(b) Immediate exercises of the fingers

(6) EXTENSOR DIGITORUM TENDON:

Path. (1) **Avulsion of terminal slip: Mallet finger**
(a) simple tendon avulsion
(b) tendon avulsion with chip fracture
(c) tendon avulsion with separation of epiphysis
(d) tendon avulsion with forward dislocation of terminal phalanx
(2) **Avulsion of middle slip:**

Clinic. (1) **Mallet finger: Baseball finger:**
(a) painful swelling at the base of terminal phalanx
(b) deformity:
(α) flexion terminal phalanx
(β) hyperextension second phalanx
(2) **Middle slip avulsion:**
(a) painful swelling at the base of second phalanx
(b) deformity:
(α) hyperextension terminal phalanx
(β) flexion second phalanx

Treat: (1) **Conservative**: Fixation:
- Method: (*a*) plaster of Paris
  - (*b*) light malleable splint
- Extent: web to tip
- Position: (A) TERMINAL SLIP:
  - Terminal joint: hyperextension
  - Proximal joint: flexion
  - (B) MIDDLE SLIP:
    - Terminal joint: flexion
    - Proximal joint: extension
- Time: 6 weeks

(2) **Operative**:
- Ind: (1) Rupture tendon with unreduced dislocation
  - (2) Non-united tendon with painful finger
- Tech: (1) Immediate open **suture**
  - (2) **Arthrodesis** of the phalangeal joint

(7) RECTUS ABDOMINIS:

Etio: (A) Trauma: Heavy weight lift, parturition, blows
- (B) Pathological: tetanus, strychnine poisoning

Clinic: Painful contractions
- Gap with two swellings

(8) QUADRICEPS EXTENSOR: (See under the knee joint)

(9) ADDUCTORS OF THE THIGH:

- Etio: Riding, jumping, swimming
- Clinic: Snap with painful inability to adduct
- Compl: Myositis ossificans

(10) TENNIS LEG: Gastrocnemius and plantaris

- Etio: sudden dorsiflexion of the foot
- Path: (*a*) partial rupture of inner head of gastrocnemius
  - \+
  - (*b*) rupture of plantaris three inches below knee
- Clinic: (*a*) severe sudden painful snap
  - (*b*) painful inability to plantarflex
- Treat: rest with **strapping**

(11) GASTROCNEMIUS:

- Etio: Sudden dorsiflexion of the foot
- Path: Rupture at the lower end of the belly
- Clinic: (*a*) sudden painful snap
  - (*b*) local bruise and tenderness
  - (*c*) painful inability to plantarflex
- Treat: complete rest with **strapping** in plantarflexion

(12) TENDO ACHILLIS:

Etio: (a) sudden severe dorsiflexion of the foot
(b) falls from height
(c) fracture dislocation of the ankle

Path: rupture at: (a) 1·5 inches above the insertion
(b) musculo-tendinous junction

Clinic: (a) painful inability of plantarflexion
(b) abnormal passive dorsiflexion
(c) local palpation: bruise, tenderness, gap

Treat: (1) **Conservative:** fixation
Method: plaster of Paris
Extent: knee to toes
Position: full equinus
Time: eight weeks

(2) **Operative:**
(1) **Trimming and suturing**
(2) **Tendon lengthening** and suturing

After-treat (a) **fixation:**
Method: plaster of Paris
Extent: knee to toes
Position: foot at right angles
Time: ten weeks

(b) **Walking stirrup:** at the end of two weeks

General treatment of rupture:

(A) PARTIAL RUPTURE:

(1) **Postural relaxation + cold applications**
↓ Method: splint or plaster bed
Time: ten days
(2) **Firm elastic bandaging with massage and protected use**

(B) COMPLETE RUPTURE:

(1) **Conservative:**
(1) **Postural relaxation:**
↓ Method: splint or plaster
Time: 8–10 weeks
(2) **Elastic bandage,** massage, movements

(2) **Operative:**
(a) Suture with chromicized catgut
↓
(b) Postural relaxation for 8–10 weeks
↓
(c) Massage and movements

(C) OLD RUPTURE:

(1) **Tendon transplantation**
(2) **Artificial silk or fascial tendon**

(III) LUXATION OF TENDON:

Etio: (*a*) **Predisposers:**
- (1) **anatomical:** angular course
- (2) **pathological:**
  - (α) deformities
  - (β) weakness of retentive ligaments

(*b*) **Exciting:** strain

Sites:
- (1) wrist: extensors of the thumb and index
- (2) ankle: peronei; tibials anterior & posterior
- (3) shoulder: long head of the biceps
- (4) hip: gluteus maximus: (snapping hip)
- (5) neck: splenius capitis

Clinic:
- (1) sudden painful weakness
- (2) locking with painful movements
- (3) palpation: tendon in abnormal position

Treat: (1) **Reduction** under anæsthesia
↓
(2) **Fixation:**
- Method: splint or plaster
- Position: of relaxation of the tendon
- Time: eight weeks

Compl:
- (1) Recurrence
  Treat: operative:
  - (*a*) grooving the bone
  - (*b*) suture of retentive ligaments
- (2) functional disability
- (3) tenosynovitis
- (4) pathological rupture

(IV) HERNIA OF A MUSCLE:

Def: Protrusion of a muscle belly through a defect in its sheath

Etio:
- (1) Congenital
- (2) Traumatic

Sites:
- (1) Biceps brachii
- (2) Adductors of the thigh

Clinic: Soft localized lump on contraction, disappearing on:
- (*a*) passive extension
- (*b*) opposed contraction

Diff. diag:
- (1) Rupture of muscle
- (2) Intermuscular cyst or new growth

Treat: Closure of the hiatus in the muscle sheath by:
- (*a*) catgut
- (*b*) fascial darning

II. INFLAMMATION OF MUSCLES, TENDONS AND APONEUROSES

(I) MYOSITIS:

(A) ACUTE MYOSITIS:

Etio: varieties: (1) **Acute suppurative myositis**
- (a) extension from a neighbouring focus
- (b) local. septic injections
- (c) pyæmic

(2) **Acute Rheumatic myositis:**
Association with: (a) fibrositis
(b) arthritis

(3) **Acute Gonorrheal myositis:**
- (a) myalgia
- (b) fibrosis

(4) **Polymyositis non-suppurativa:**
Etio: (a) intestinal toxins
(b) focal toxins. tonsils
(c) neuro-myositis

(5) **Gas gangrene:** (See under gangrene)

Clinic. (1) Pain, tenderness and swelling of the muscle
(2) Induration and contraction of the muscle
(3) Painful. (a) active contraction
(b) passive extension
(4) Fixation of the limb in position of muscular action

Treat: (1) **Local:**
(a) rest in relaxation + warmth
↓
(b) massage + rubefacients
↓
(c) physiotherapy and electrotherapy

(2) **Focal:** treatment of focal sepsis. tonsils
(3) **Symptomatic:** Quinine, Salicylates
(4) **Operative:**
Ind: (a) suppuration incision and drainage
(b) gas gangrene: excision; amputation

(B) CHRONIC MYOSITIS:

(1) TUBERCULOUS MYOSITIS:

Etio: Extension from a neighbouring focus
Path: (1) local tuberculoma
(2) tuberculous infiltration

(3) cold abscess
(4) fistulæ

Clinic: any intramuscular swelling in a tuberculous patient

Diff. diag: (1) Lipoma: intermuscular
(2) Gumma
(3) Cyst
(4) Pseudo-hernia

(2) SYPHILITIC MYOSITIS:

Varieties: (A) **Myalgia**
(B) **Diffuse gummatous infiltration**
(C) **Localized muscular gumma:**

Site: Calf, abdominal wall, sternomastoid

Clinic: (1) intramuscular indolent induration
↓
(2) sub-acute inflammatory induration
↓
(3) sub-acute abscess
↓
(4) gummatous ulcer

Clinic: **Any intramuscular swelling in a syphilitic patient**

(3) ACTINOMYCOSIS AND GLANDERS MYOSITIS:

(C) EPIDEMIC MYALGIA OR PLEURODYNIA:

Path: sudden painful spasm at the diaphragmatic attachment to the chest wall

Clinic: (*a*) sudden onset
(*b*) acute symptoms: pain + tenderness + spasm
(α) **Thoracic:** respiratory pain
(β) **Abdominal:**

Diff. diag: (1) Thoracic: pleurisy, pneumonia
(2) Acute abdomen: appendicitis

Treat: (1) Local: rest + warmth + rubefacients
(2) General: salicylates

(II) TENOSYNOVITIS:

(A) ACUTE TENOSYNOVITIS:

Etio: (1) **Acute Traumatic tenosynovitis:**
. acute strain, contusions, rupture
(2) **Acute Infective tenosynovitis:**
: septic wounds
: whitlows and boils
: blood borne: pyæmia
(3) **Acute Rheumatic tenosynovitis:**
: in 2nd or 3rd week of acute rheumatism
: tendons of wrist and ankle

(4) **Acute Gonococcal tenosynovitis:**

Clinic: (1) painful active movements and passive stretching
(2) spasm with abnormal posture
(3) frictional creaking
↓
(4) discrete tender swelling along the tendon
↓
(5) diffuse swelling (tendo-cellulitis)

Compl. (1) adhesions
(2) contractures
(3) suppuration
(4) sloughing
(5) spread to surrounding structures

Treat: (1) **Conservative:** Rest in relaxation
Heat + rubefacients + Bier
(2) **Suppuration:** Incision and evacuation of pus
Antiseptic baths and irrigations
(3) **After-treatment:** Early massage and movements

(B) CHRONIC TENOSYNOVITIS:

Path. varieties: (1) **serous:** effusion
(2) **adhesive:** peritendinous adhesions
(3) **formative:** nodules
(4) **fungus:** papillomatous fringes
(5) **fibrofatty:**
(6) **necrosing:** pathological rupture

Clinical varieties

(1) **chronic traumatic tenosynovitis:**

(*a*) **serous**

(*b*) **adhesive**

(*c*) **stenosing tendovaginitis:**

Etio. occupational strain of thumb: charwomen
Path. fibrous thickening of the sheath of:
(α) abductor pollicis long.
(β) extensor pollicis brevis
Clinic: Tender thickening just above the radial styloid
Treat. Division of thickened sheaths

(*d*) **peritendinous fibrosis**

Etio. trauma to the hand
Site: extensor of the hand
Clinic: circumscribed hard swelling on the dorsum of the hand
Treat: dorsal plaster cast

(2) **Osteoarthritic tenosynovitis:** necrosing
(3) **Gouty tenosynovitis:** formative
(4) **Gonorrheal tenosynovitis:** adhesive
(5) **Syphylitic tenosynovitis:**
(*a*) **Serous:** symmetrical, painless, indolent
(*b*) **Gumma:** local
(*c*) **Infiltrating gummatous** peritendinitis with indurated serpiginous ulcer
(6) **Tuberculous tenosynovitis:**

Clinic: (*a*) **Fungus:**
(α) soft pulpy swellings
↓
(β) multiple softenings
↓
(γ) sinuses and granulations
(*b*) **Serous:** effusion with melon seeds;
: soft painless fluctuating linear swelling along the tendon
(*c*) associated features:
(α) age: 18–35
(β) painless, insidious onset
(γ) muscular wasting marked

Sites: (*a*) flexors of wrist: compound palmar ganglion
(*b*) peronei and extensors: secondary to T.B. Tarsus

Treat: (*a*) **Conservative:**
(α) Rest in relaxation by splints or plasters
+
(β) Rubefacients and Bier
(*b*) **Operative:**
(*a*) Scraping and B.I.P.P.
(*b*) Excision

(III) APONEUROSITIS:

(A) **Acute aponeurositis:**

Etio: (1) **Gonorrheal**
(2) **Influenzal**
(3) **Rheumatic**
(4) **Infective:** tonsillitis
(5) **Traumatic:** acute strain
(6) **Gouty**

(B) **CHRONIC APONEUROSITIS:**

Etio: (1) **Sequela** to all acute varieties
(2) **Postural** strain + sprain

Clinic: (1) Pain + tenderness + spasm
(2) Fixed posture
(3) Painful movements and passive stretching

Clinical entities:
(1) Lumbago
(2) Torticollis
(3) Acute spasmodic valgus

Compl: (1) Deformities
(2) Contractures
(3) Invalidism

Treat: (1) Treat the etiology
(2) Local. Rest in relaxation
Heat, rubefacients, Bier
Physio and electro therapy

III. MYOSITIS FIBROSA

Contractures of muscles and aponeuroses

(I) CONGENITAL TORTICOLLIS:

Etio: Difficult labour with breech presentation

Path: Local contusion
↓
Rupture and thrombosis of veins
↓
Obstruction to venous return
↓
Fibrosis and contracture of the muscle

Clinic: (1) **Sternomastoid tumour:**
firm, spindle shaped swelling in the lower half of sternomastoid three weeks after birth
↓
(2) **Torticollis:**
(*a*) posture: head. flexed
. bent to same side
. rotated to other side
(*b*) compensatory. scoliosis of cervical spine
(*c*) local: palpable ribbon-like muscle
(*d*) associated: homolateral hemiatrophy of the face

Treat: (1) **Manipulative**
(2) **Manipulations + Retention in plaster**
(3) **Tenotomy:**
(*a*) closed
(*b*) open
After-treat: immobilization
Method: sand bags
Position: corrected
Time: fortnight

(4) **Lengthening of sternomastoid**

After-treat: Immobilization
Method: plaster collar
Position: corrected
Time: 4–6 weeks

After-treat: Physiotherapy, active and passive movements

(II) VOLKMANN'S ISCHÆMIC CONTRACTURE:

Def: flexion of fingers and wrist
+
partial paralysis of forearm flexors
due to myositis fibrosa caused by injuries round about the elbow joint

Etio: age: 6–11 years

(1) **Fracture and dislocation elbow**
- (a) separated humeral epiphysis
- (b) supra-condylar fracture
- (c) fracture radius and ulna

(2) **Brachial artery**
- (a) rupture
- (b) *thrombosis*
- (c) occlusion
- (d) endarteritis
- (e) pressure

(3) **Hæmatoma:** in the region of elbow
(4) **Faulty bandage:** splint, plaster, malposition
(5) **Damage to nerves:**
(6) **Spontaneous:** *hæmophilia*

Path: (A) **Circulatory theory:**

(1) Arterial ischæmia
+
(2) Venous obstruction
↓
(3) Venous congestion and thrombosis
↓
(4) Degeneration and leucocytic infiltration
↓
(5) Fibrosis
↓
(6) Contracture with partial paralysis

(B) **Sympathetic theory:**
Periarterial sympathetic excitation

Clinic: (A) **Acute stage:**
(1) Pain, cyanosis and œdema of fingers
+
(2) Diminished radial pulse
+
(3) Indurated and swollen flexor muscles

(B) **Paralysis stage:**
(1) Partial paralysis and contracture of flexors and pronators
(2) Extensors and supinators normal

Diagnosis: (1) **Complication of elbow injury**
(2) **Fingers extended when wrist is flexed**
Fingers flexed when wrist is extended

Diff. diag: (1) Ulnar nerve paralysis
(2) Radial nerve paralysis
(3) Median nerve paralysis
(4) Cerebral monoplegia
(5) Skin or cellular contracture
(6) Flexion ankylosis of wrist

Association: One or more nerve palsies

Treat: (A) **Prophylactic:**
(1) *immediate accurate fracture reduction*
(2) examination after 12 hours after treatment of every elbow injury
(3) avoid pressure round about an injured elbow
(4) avoid acute flexion of an injured elbow

(B) **Acute phase: within 48 hours of onset**
Ind: (*a*) intense and increasing pain
(*b*) feeble radial pulse
(*c*) blue and swollen arm
Tech (1) Place the arm on a pillow with
↓ elbow at 120 degrees
(2) **Removal of the blood clot by**
\+ **incision**
(3) **Periarterial sympathectomy**

(C) **Chronic phase: partial paralysis with contracture**

(1) **Mechanical:**
(*a*) physiotherapy
(*b*) **Robert Jones:** retentive splints on the dorsal aspects of fingers → hand → wrist → forearm

(2) **Operative:**
(*a*) **Max page:** muscle sliding

(b) **Hamilton Bailey:** Sliding of median epicondyle with its attached muscles

(c) **Tendon lengthening:**
Flexor Carp. Rad.
Flexor Carp. Uln.
Flexor Poll. Long.

(d) **Sub-periostial excision of both bones**

(e) **Arthrodesis wrist:** after excision of carpals

(f) **Neurolysis**

After-treat: physiotherapy, electrotherapy
passive and active movements
retentive apparatus

(III) DUPUYTREN'S CONTRACTURE:

Def: Bilateral, assymetrical flexion deformity of ring and little fingers due to **chronic inflammatory contracture of palmer facia**

Etio: (1) men
(2) middle age
(3) chronic rheumatism and gout

Path: Changes in palmer fascia and its longitudinal process:
Chronic plastic inflammation → Induration → Contracture

Clinic: (a) nodular tender thickening at the palmer aspect of the root of the ring finger
↓
(b) ring finger: flexion of the proximal two joints
↓
(c) little finger: flexion of the proximal joints

Diff. diag: (a) Tenosynovitis
(b) Congenital contracture of little finger

Treat: (1) **Conservative:**
(a) physiotherapy and electrotherapy
(b) fibrolysin
(c) stretching and retentive splints
(d) X-Rays and radium

(2) **Operative:**
(a) **Fasciotomy:** nicking and stretching the bands
(b) **Excision of the fascia:**
: through ⊓ incision

(*c*) Excision of the skin and fascia with skin-grafting
(*d*) **Excision of the head of the first phalanx**

Post. Compl: (*a*) hæmatoma and suppuration
(*b*) sloughing of skin
(*c*) recurrence

IV. MYOSITIS OSSIFICANS

(I) MYOSITIS OSSIFICANS PROGRESSIVA:

Def. Generalized and progressive deposition of calciu and bone in muscles, aponeuroses, ligaments ar fasciæ

Etio Sex: male
Age: children, young adults
Sites muscles of the back, spine, thorax

Clinic. (1) Bony deposition in sheets
(2) Poker man
(3) Congenital abnormality of great toe

Compl. Respiratory infection
Treat **Parathyroid extract**

(II) MYOSITIS OSSIFICANS TRAUMATICA:

Etio. Causes (*a*) contusions · periosteal
(*b*) fractures and dislocations
(*c*) overzealous mobile treatment
(*d*) occupations, frictions & stresses
Time 5–8 weeks after trauma

Path · (1) Hæmatoma or periosteal laceration
↓
(2) Calcification
↓
(3) Ossification. between and along muscle fibres

Sites. (1) **Suprapatellar:** Quadriceps avulsion
(2) **Ankle joint:** avulsion of anterior ligament *from neck of astragulus*
(3) **Knee joint:** avulsion of internal lateral ligament from internal condyle
(4) **Shoulder joint:** avulsion of acromioclavicular, conoid and trapezoid ligaments in clavicular dislocations
(5) **Elbow joint:**
(*a*) avulsion of brachialis from ulna
(*b*) avulsion of forearm muscles from condyles
(*c*) disinsertion of biceps
(6) **Adductor:** Adductors of the thigh in riders

Clinic: (1) History and site
(2) Mechanical disability
(3) Palpation
(4) X-Rays: cloudy or dense shadow

Treat: (1) **Complete rest for six months**
(*a*) no massage and passive stretchings
(*b*) active exercises allowed
(2) **Excision** of the bone: after one year
(3) **Parathyroid** extract

(III) FALSE EXOSTOSES:

Local ossifications in muscles, tendons, ligaments: in
(*a*) **Osteoarthritis**
(*b*) **Neuropathic Arthropathy**

V. TUMOURS OF THE MUSCLES, TENDONS AND APONEUROSES

(A) TUMOURS OF THE MUSCLES

(1) CAVERNOUS ANGIOMA

Site: lower extremity, triceps
Clinic: compressible, pulsating, thrill and murmur

(2) LYMPHANGIOMA

(3) LIPOMA: intermuscular

Site: shoulder, thigh, abdominal wall
Clinic: relaxed muscle: soft, fluctuating } swelling
contracted muscle: firm, hard }

Diff. diag: (*a*) **Cold abscess**
(*b*) **Gumma**
(*c*) **Cysts**
(*d*) **Other growths**: angioma, fibroma

(4) FIBROMA: DESMOID TUMOUR OF ABDOMINAL WALL

Etio: Sex and age: women between 20 and 40
Predisp: (1) Lineæ albicantes: (parturition)
(2) Trauma

Path: Fibroma from muscle sheath or fibrous tissue

Clinic: (*a*) slow growth
(*b*) **local infiltration**: no capsule
(*c*) **adhesion** to skin and bone
(*d*) **recurrence** after removal

Treat: **Excision**
↓
Radium

(5) SARCOMA:

Sites: tongue, calf muscles
Path: fibrosarcoma from muscle sheaths
Clinic: (1) firm, circumscribed, indolent, painful, slightly mobile growth along the length of the muscles, with:
(a) progressive growth in size
(b) signs of vascularity
(2) X-Ray. pressure changes in underlying bone
Diff. diag: (a) Bone sarcoma
(b) Gumma
(c) Innocent growths
(d) Aneurysms
Treat: (1) **Local excision** of the whole muscle
(2) **Amputation**
(3) **Radium, X-Rays**

(6) MYOMA:

(A) **Rhabdomyomata:** Bladder, Vagina, Heart
(B) **Leio-Myomata:** Uterus, Œsophagus, Stomach, Ovary

(7) CARCINOMA:

Secondary by extension: muscles of the chest

(B) TUMOURS OF THE TENDONS:

(1) GANGLION:

Def: **Cystic swelling in connection with a tendon sheath,** in the neighbourhood of a joint
Path: (a) Synovial herniation
(b) Colloid or mucoid degeneration of tendon sheath
(c) Lymphangioma
Contains gelatinous glairy fluid
Sites: Dorsum wrist, ankle, knee
Clinic: Globular, fluctuating or hard, small swelling along the course of a tendon and related to it
Diff. diag: (a) adventitious or anatomical **bursitis**
(b) **sebaceous cyst**
(c) **encapsulated lipoma**
(d) **cold abscess**
Treat: (1) **Subcutaneous rupture** + tight bandage
(2) **Aspiration + Injection** + tight bandage
(a) collodion
(b) 0.5–2 c.cs. of 5% sod. morrhuate
(3) **Evacuation** through a puncture + tight bandage
(4) **Excision** with closure of hiatus in tendon sheath or joint

(2) GIANT CELLED TUMOURS

(3) **CHONDROMA**: Myxochondroma
(4) **TENOSYNOVIOMA**: **Xanthoma**: Foam cells
(*a*) innocent
(*b*) malignant
(5) **HÆMANGIOMA**
(6) **FIBROMA**
(7) **SARCOMA**
(8) **ENDOTHELIOMA**

(C) **TUMOURS OF THE APONEUROSES:**
(1) **FIBROMA**
(2) **SARCOMA**
(3) **CHONDROMA**
(4) **OSTEOMA**

VI. OPERATIONS ON MUSCLES, TENDONS AND FASCIAE

) **TENOTOMY**: Division of a tendon

Ind: (1) **Contractures**: Dupuytren
(2) **Spasms**: spastic paraplegia
(3) **Deformities**: Talipes equinus
(4) **Preliminary**: to other procedures on tendons
(5) **Pressure syndrome**: Scalenus anticus

Tech: (1) **Subcutaneous**: tenotomy knife
(2) **Open**

SPECIAL TENOTOMIES AND MYOTOMIES:

(1) **STERNOMASTOID:**

Ind: **Torticollis**

Site: (*a*) high: mastoid insertion
(*b*) low. near clavicle
(*c*) middle: in tendon lengthening

Tech: (A) Open. vertical incision
Contraind: (*a*) absent muscle line
(*b*) scar prominent
(B) Subcutaneous:
(*a*) Rt. side: division from inner to outer side
(*b*) Left side: division from outer to inner side

After-treat: complete rest for 4 days
massage, stretchings and exercises
no plaster fixation

(2) FLEXION DEFORMITY OF HIP:

(in Infantile Paralysis)

Tech: (A) Subcutaneons: in mild cases
- (*a*) Pass a tenotome below ant. sup. iliac spine
- (*b*) Cut inwards

(B) Open: in severe cases:
- (*a*) Incise along anterior third of iliac crest and outer border of scarpa
- (*b*) Detach origins of the muscles

After-treat: Correction of deformity by:
- (*a*) Forcible correction (beware of fracture femoral neck)
  ↓ Plaster of Paris
- (*b*) Weight extension in adducted position

Muscles cut: Sartorius, Tensor fasciæ femoris, Gluteus med. Rect. femoris, Iliopsoas, Anterior capsule

(3) TENOTOMY OF ADDUCTORS OF THE THIGH:

Ind: (A) **Adduction deformity**: in
- (*a*) spastic paralysis
- (*b*) arthritis hip

(B) **Accessory**: in
- (*a*) *osteotomy of the femur*
- (*b*) arthrodesis of the hip
- (*c*) reduction of congenital hip dislocation

Muscles: Adductor Longus, Adductor Brevis, Gracilis

Method (*a*) subcutaneous
(*b*) open

Site: near origin

(4) TENOTOMY OF THE HAMSTRINGS

Ind: (*a*) **spastic paraplegia**
(*b*) **flexion ankylosis of the knee**

Muscles. Iliotibial band, Biceps femoris Semitendinosus, Gracilis

Method: Open. (*a*) outer: over biceps tendon
(*b*) inner: over semitendinosus & gracilis

(5) TENOTOMY OF TENDO ACHILLIS:

Ind: **Talipes Equinus: in older childhood to adolescence**

Methods: (A) Subcutaneous

Ind: (*a*) adults
(*b*) moderate shortening

Tech: Cut inner half close to insertion
Cut outer half 2 inches higher up
Forcible dorsiflexion of the foot

(B) Open
Ind : (a) children
(b) excessive shortening
(c) pronounced spasm
(d) adhesions
Tech : incise parallel and to one side

(6) TENOTOMY OF TIBIALIS : anterior and posterior
Ind : **Talipes Varus** :
Method : Open :
Tech : Divide T. post. just above internal malleolus
Divide T. ant. below annular ligament
Avoid artery and other tendons

(7) TENOTOMY OF THE PERONEI :
Ind : **Spastic talipes valgus**
Method : open : incise vertically above external malleolus

(8) TENOTOMY OF TOE EXTENSORS :
Ind : **Pes Cavus**
Method : (A) Subcutaneous : 2nd to 5th toes
(B) open : great toe
Site : over the heads of metatarsals

(9) TENOTOMY OF PLANTAR FASCIA :
Ind : **Pes Cavus**
Method : Subcutaneous :
(a) insert tenotome 1 inch in front of os calcis tubercle
(b) pass out between skin and plantar fascia
(c) cut from without inwards
(d) wrench the foot to correction

(10) STEINDLER'S OPERATION :
Def : Separation from the under surface of os calcis and sliding forwards the origin of :-
Plantar fascia
Short muscles of the sole
Long and short plantar ligaments
Ind : (a) **Pes Cavus**
(b) **Talipes equinovarus** : advanced
Tech : (1) Incision :
(a) from the centre of the back of the heel to the level of the mid-tarsal joint
(b) parallel to and ¾ inches above the outer border

(c) down to the os calcis
(2) separation of muscle origins from the bone

After-treat: (A) Mobile:
(a) fixation on a flat metal. 4 days
↓
(b) daily stretchings 5th day
↓
(c) walking: 10th day

(B) Immobile:
(a) forcible wrenching to correction
↓
(b) fixation:
Method. plaster of Paris
Position: corrected
Time: six weeks

(II) TENDON SUTURE:

Ind: (1) **Rupture**
(2) **Lengthening**
(3) **Transplantation**
(4) **Tenodesis** (fixation)

Time: (1) **Primary:** within 6–8 hours of a clean wound
(2) **Secondary** (a) 10–14 days after the rupture
(b) after subsidence of sepsis

Tech. Suture. Linen thread No. 60
Chromic catgut
Kangaroo tendon

Leave the tendon free in surrounding fat
Construction of new tendon sheath by tunica vaginalis graft
Do not drain

After-treat. (1) Fixation:
Method plaster of Paris
Position: relaxation on suture line
Time six weeks
(2) Physiotherapy: after six weeks

(III) TENDON TRANSPLANTATION:

Principles: (1) Muscles to be transplanted must be:
(a) one that can be spared
(b) strong and active
(c) capable of re-education
(d) near and allied to recipient

(2) Tendon transplantation in muscles of postural activity is a failure
Erector spinæ, Glutei, Quadriceps extensor, Calf muscles

Methods: (1) Tendon into Tendon
Donor passes through a slit in intact recipient
(2) Tendon into Bone:
(*a*) Periosteal slit
(*b*) Nailing the bony insertion into the bone
(*c*) Bone drilling

Some special transplantations:

(1) **Musculospiral Paralysis:**

(A) **Complete:**

Donor:	*Recipient:*
Pronator radii teres:	Ext. carpi radialis long. & br.
Flexor carp. radialis:	Abductor pollicis longus Extensor pollicis Brevis
Flexor carp. ulnaris.	Extensors of the digits Extensor pollicis longus

(B) **Partial:**

Donor.	*Recipient:*
Flexor carpi radialis.	Abductor pollicis longus
Supinator longus:	Ext. pollicis brevis
Ext. carpi rad. long.	Ext. pollicis longus

After-treat: (1) Fixation.
Method. cock up splint
Position. wrist: extended
thumb abducted
Time: six weeks
(2) Active movements as soon as wound heals

(2) **Quadriceps paralysis:**

Donor.	*Recipient*
Sartorius	Quadriceps extensor

Tech. (1) Incision: Inner side of the thigh → Inner border of patella → Tubercle of tibia
(2) *Separation of sartorius insertion*
(3) *Suture of sartorius to rectus tendon*

After-treat (1) Fixation in extension. for 10 days
(2) Active movements. from 10th day
(3) Full flexion: after 8 weeks

(3) **Talipes Calcaneous:**

Donor:	*Recipient*
Flexor hall. long.	
Flexor dig. long.	Tendo achillis
Peronei.	

Tech (1) Incision *Midline lower part of the calf*
(2) Separation and division of tendons low down
(3) Suture of the tendons into tendo achillis

After-treat: (1) Fixation:
Method: splint or plaster
Position. plantar flexion
Time: six weeks

(4) **Paralytic Talipes Varus**

Donor:	*Recipient*
Tibialis anticus	cuboid
	base of the fifth metatarsal

Tech: (1) Incision. over the first metatarsal base
(2) Division of Tib. ant. tendon with bone chip
(3) Incision: anterior midline just above ankle
(4) Draw the Tib. ant. tendon through
(5) Incision over cuboid or 5th metatarsal base
(6) Draw and fix the Tib. ant. tendon

After-treat: Fixation:
Method: plaster of Paris
Position: dorsiflexion and eversion
Time. six weeks

(5) **Pes Cavus with clawing:**

Donor:	*Recipient*
Ext. long. hallucis	neck of first metatarsal
Ext. dig. com	necks of 2, 3, 4th metatarsals
Ext. dig. com.:	external cuneiform (Hibb)

Tech: (1) Division of Ext. tendon expansion
(2) Drill the neck of a metatarsal or cuneiform
(3) Thread the tendon through

After-treat: Fixation:
Method plaster of Paris
Position: dorsiflexion
Time. six weeks

(IV) RECONSTRUCTION OF TENDONS: by

(A) Fascia Lata
(B) Tendon graft

(V) TENDON SHORTENING:

Ind: (1) Paralytic stretching
(2) Traumatic fibrosis with stretching

Tech: (*a*) Excision and suture
(*b*) *Y changed into* V

After-treat: Fixation:
Method: plaster of Paris
Position. relaxation
Time: six weeks

(VI) TENDON FIXATION: TENODESIS:

ligamentation of a tendon

(1) **Tendo achillis:**

Ind: Paralytic talipes calcaneus

(2) **Peronei:**

Ind: (*a*) Paralytic talipes varus
(*b*) Paralysis of musculocutaneous nerve

Tech: (*a*) separation of a part of tendon from its muscle
(*b*) its attachment to the proximal bone after correction of deformity

After-treat: Fixation:
Method: plaster of Paris
Position: over correction
Time: 12 weeks

(VII) MYOTOMY:

Ind: (1) **operative incisions:**
Split along the fibres: do not cut across except:
(*a*) enlarging an incision at right angles
(*b*) passage for a drainage tube
(2) **sliding operation** for contractures
Max page for Volkmann

(VIII) FASCIOTOMY:

Ind: **Pes cavus**
Talipes equino varus

Tech: Division of plantar fascia and ligaments

(IX) FASCIAL GRAFTS: fascia lata

Ind: (1) **Repair of hernia:** big or recurrent
(2) **Facial paralysis**
(3) **Fracture patella**
(4) **Reconstruction of cruciate ligaments knee**
(5) **Recurrent dislocation of the shoulder**
(6) **Postage stamp for cranial hæmorrhage**

VII. IMPORTANT POINTS

(1) Muscle rupture : two swellings with a central gap
Muscle hernia : central swelling on active function

(2) Primary repair of a severed tendon should be performed whenever possible and that too as soon as possible

(3) Repaired tendon wound should not be drained. If drainage is necessary, primary tendon repair is not advisable

(4) Time of tendon repair:
(*a*) Primary: immediately: within 6–8 hours
(*b*) Secondary. after granulations: 10–14 days
(*c*) Delayed: excision of fibrous tissue and repair

(5) After repair of the torn tendons, tunica vaginalis graft may be used to form a new tendon sheath so as to prevent adhesions; or the tendon may be left surrounded by fat

(6) Anchoring adhesions within the tendon-sheaths are one of the chief causes of disability following injuries and can be prevented by:
  (a) gentle operative technic
  (b) isolation by grafts
  (c) early use of the part

(7) Local or regional anæsthesia is the best for the exploration of tendon ruptures as patient can actively co-operate

(8) The commonest injury to the finger musculature is the rupture of extensor tendon at its insertion into the last phalanx Mallet finger

(9) The pathognomonic signs of acute tendon rupture:
  (a) Acutely painful loss of function of a particular muscle during athletics
  (b) Loss of function of a particular muscle after an incised wound
  (c) In both cases, the function of other associated muscles or other tendons of the same muscle is intact

(10) In every case of an incised wound or a dislocation, look for tendon rupture

(11) Tennis elbow Pain and tenderness below the external humeral epicondyle, worse on attempts at pronation and extension, due to injury to common extensor origin or deep head of the pronator or radio-humeral ligament, treated by:
  (a) rest
  (b) elastic strapping
  (c) manipulations: Extend & adduct

(12) Pathological rupture of extensor long pollicis is one of the sequelæ of fracture lower end of the radius

(13) Mallet finger. Flexion deformity of the terminal phalanx due to rupture of the terminal slip of extensor

(14) *Tennis leg: Rupture of inner head of gastrocnemius and* plantaris, giving rise to snap with inability to plantarflex during tennis or jumping, and treated by.
  (a) elastic strapping
  (b) immobilization in plantarflexion

(15) Fibrositis: Painful decubitus
Myositis Painful function and spasm
Tenosynovitis: Exquisitely painful active movement and passive stretching

(16) Most common cause of acute fascitis is gonorrhea, viz. acute lumbago, acute plantar fascitis

(17) Most common causes of chronic tenosynovitis:
- (a) Tuberculosis
- (b) Chronic traumatic

(18) Sinuses round about the wrist:
- (a) ? T. B. wrist joint
- (b) ? T. B. carpus
- (c) ? T. B. tendons

(19) Most common globular swelling round about wrist or knee or ankle:
- (a) Ganglion . wrist & ankle
- (b) Bursitis : knee

(20) Volkmann's Ischæmic Contracture
- (a) Most important cause is blood effusion round the elbow, contributory cause being external pressure due to position, bandage or splint
- (b) Clinically there are two stages
  - (1) Acute circulatory stage: 48 hours
  - (2) Late paralytic stage:
- (c) Flexors and Pronators only are affected
  Extensors and Supinators escape
- (d) There is no paralysis of Ext. digit communis
  Flexion of the wrist → Extension of the digits
  Extension of the wrist → Flexion of the digits
- (e) Differential diagnosis from nerve paralysis
- (f) Critical period when paralysis contraction can be saved by prompt measures is not more than 48 hours
- (g) Massart's treatment stages:
  - (a) Prophylactic : within 48 hours
    Remove the pressure
  - (b) Progressive but recoverable:
    Brachial sympathectomy
  - (c) Non-recoverable:
    - (1) Muscle sliding
    - (2) Tendon lengthening
    - (3) Bone shortening

(21) Never forget to re-examine a limb put in bandage, splint or plaster within 12 and 24 hours

(22) Avoid pressure encirclement of a limb and also pressure on the anterior aspect of elbow joint

(23) Most common sites for Traumatic Myositis Ossificans
- (1) Brachialis anticus : Fracture lower humerus
- (2) Adductors of the thigh . Fracture middle femur

(24) Acute suppurative tenosynovitis must be opened as soon as possible to avoid sloughing

(25) A muscular swelling:

(a) ? Contusion or hæmatoma

(b) ? Abscess

(c) ? Gumma

(d) ? Lipoma (inter-muscular)

(26) Tendon transplantation is to be done when nerve regeneration has stopped Requires careful re-education of donor muscle

(27) Contracture of tendo achillis: Talipes equinus

(a) young children: Active and passive stretchings

(b) older childhood to young adults } Tenotomy

(c) adults: Raise the heel of the shoes
Complete tenotomy of tendo achillis is indicated only in older children and adolescents and should not be done in adults

(28) Complete aspesis must be assured in fascia lata grafts

CHAPTER III

THE BURSÆ

I. TRAUMA

(1) CONTUSION:

Sites: Prepatellar, olecranon

Clinic: (1) History of injury
(2) Anatomical site
(3) Inflammatory cystic swelling

Compl: (1) Bursal hæmatoma
(2) Bursal hydrops
(3) Sclerosing bursitis
(4) Suppurative bursitis

Treat. (1) Cold applications + rest
↓ (2) Heat + rubefacients + massage
↓ (3) Aspiration + rubefacients + pressure
↓ (4) Incision + drainage: if suppuration
↓ (5) Excision: if chronic sinus

(2) PENETRATING WOUNDS:

Clinic: (1) Nothing special
or (2) Escape of glairy fluid
or (3) Sepsis with non-healing sinus

Compl: (1) Sepsis
(2) Fistulæ
(3) Septic arthritis

(3) CHRONIC TRAUMATIC BURSITIS:

Occupation bursæ

Varieties: (1) **Codman's disease:** Sub-deltoid bursitis
(2) **Student's elbow:** Olecranon bursitis
(3) **Weaver's bottom:** Tuber ischii bursitis
(4) **Housemaid's kneé:** Prepatellar bursitis
(5) **Parson's knee:** Pretubercular bursitis

Path: (1) Thickened wall
(2) Turbid fluid
(3) Loose bodies
(4) Adhesions

Clinic: Well defined cystic fluctuating swelling in an anatomical site

Treat: (1) Scraping with carbolization
(2) Excision through a flap incision

(4) ADVENTITIOUS BURSÆ:

Def: Development of enlarged loculated spaces in the subcutaneous tissues, at the site of prolonged friction

Clinical Varie: (1) **Billingsgate hump:** Seventh cervical spine
(2) **Bunion:** Head of first metatarsal
(3) **Pathologic:** Over bony prominences
(a) Pott's angular curvature
(b) Talipes
(c) Exostoses

II. INFECTION

(1) ACUTE INFECTIVE BURSITIS:

Etio: (1) **Trauma:** contusion, wound
(2) **Septic infection:**
(a) wound
(b) adjacent focus
(c) bloodstream
(d) lymphangitis
(3) **Secondary to arthritis**

Path: (1) **Serous**
(2) **Suppurative**

Bact (1) Pyococci } Prepatellar bursa
(2) Streptococci } Olecranon bursa
(3) Gonococci: Tendo achillis bursa

Clinic: (1) **Anatomical site**
(2) Spasm of the overlying muscle
(3) (a) **Serous**; tensely distended, localized, fluctuating inflammatory swelling
(b) **Suppurative:**
(α) loss of outline
(β) surrounding œdema
(γ) synovial effusion
(δ) general septic toxæmia

Diff. diag: (1) Synovitis
(2) Cellulitis
(3) Osteomyelitis

Compl: (1) Acute lymphangitis
(2) Acute cellulitis
(3) Acute arthritis

Treat: (1) Rest and immobilization in relaxation
+ (2) Heat and rubefacients
↓ (3) Incision and drainage: if pus

(2) CHRONIC INFECTIVE BURSITIS:

(A) **Secondary**: secondary to chronic arthritis

Clinic: (1) Signs of infective arthritis
(2) Signs of chronic bursitis

(B) **Tuberculous Bursitis:**

Etio: Tuberculosis of the underlying bone or joint

Sites: (1) Around the hip
(2) Around the knee
(3) Iliopsoas bursa
(4) Gluteal bursa
(5) Subacromial bursa

Path: (1) Thickening with lining granulations
(2) Tuberculous pus with melon-seed bodies
(3) Chronic sinuses

Clinic: (1) **Fluctuating swelling stage:**
(*a*) Well defined or masked fluctuating cystic swelling
(*b*) Spasm of the overlying muscle
(c) Fixation in the position of muscular action
(2) **Chronic sinuses stage**

Diff. diag: (1) T. B. arthritis
(2) T. B. bone
(3) **Deep cold abscess**
(4) **Lipoma** or fibroma
(5) Angioma or aneurysm

Treat: (1) Curettage and B.I P.P.
(2) **Excision**

(C) **Syphilitic bursitis:**

(1) **Secondary** stage: transitory symmetrical effusion
(2) **Tertiary** stage:
(*a*) Local gumma → gummatous ulcer
(*b*) Diffuse gummatous bursitis

(D) **Gouty bursitis:** Chalky deposits

III. NEW GROWTHS OF THE BURSAE

(1) **Endothelioma**
(2) **Fibroma**
(3) **Sarcoma**
(4) **Myxoma**

IV. CONSIDERATIONS IN AFFECTIONS OF SPECIAL BURSAE

(1) THYROID AND INFRAHYOID BURSÆ:

Clinic: (1) Superficial round **midline** cystic swelling
(2) Median cervical fistula

(2) BURSÆ ROUND ABOUT THE SHOULDER

(A) Sub-deltoid or Subacromial

Etio: (1) Acute rheumatic bursitis
(2) Chronic tuberculous bursitis
(3) Chronic traumatic bursitis: Codman

Clinic: (1) Sub-deltoid fullness
(2) **Painful abduction**
(3) Grating

(B) **Subscapular:** Secondary to arthritis

(C) **Infraspinatous:** Secondary to arthritis

(D) **Biceps:** Secondary to arthritis

(E) **Supra-acromial:** Adventitious bursa

(3) BURSÆ AROUND THE ELBOW:

(A) Olecranon:

Etio: (1) Trauma: (*a*) acute
(*b*) chronic: student, miner
(2) Acute infective: ascending lymphangitis

Treat: Drainage: Incision curved upwards

(B) Bicipital:

Anat: (*a*) Bursa between the tendon and the radius
(*b*) Bursa between the tendon and the ulna

Clinic: (1) Deeply seated ante-cubital cystic swelling
(2) Painful and limited flexion and supination

(4) BURSÆ AROUND THE HIP:

(A) Ischial:

Etio: (1) Weavers bottom
(2) Tuberculosis
(3) Extension from a bed sore

Clinic: (1) Painful inability to sit
(2) **Sinuses**

(B) Iliopsoas:

Anat: Communicating with.
(*a*) Hip joint
(*b*) Psoas sheath

Etio: (1) T. B. Hip → T. B. Bursitis → Psoas abscess

Clinic: (1) Tense cystic swelling in scarpa
(2) **Flexion of the hip**

(C) Trochanteric:

Anat: Between
(1) Gluteus max. and trochanter
(2) Gluteus max. and Vast. ext.
(3) Gluteus med. and bone
(4) Gluteus min. and bone
(5) Subcutaneous

Etio : Tuberculosis : T. B trochanter
Clinic : (1) Local cystic swelling
(2) **Eversion of the hip**
(3) All movements except inversion normal
Diff. diag : (1) Arthritis hip
(2) Osteomyelitis trochanter
Treat : Excision

(5) BURSÆ AROUND THE KNEE :

(A) Patellar :

(1) Prepatellar :

(a) Acute suppurative :
Etio : (1) Trauma
(2) Ascending lymphangitis leg
Treat : Lateral incisions and drainage

(b) Housemaid's knee :
Path : Chronic occupational bursitis
Treat : Excision through up-curved incision

(2) Tuberosity :

(a) Parson's knee :
Path : Chronic occupational bursitis
Treat : Excision

(3) Retro-ligamentous :
Etio : Sprain
Clinic : Cystic swelling on either side of lig. patellæ

(B) Popliteal :
Anat : Between . (1) **Inner :**
(a) Femur and gastrocnemius
(b) Tibia and semi-membranosus
(2) **Outer :**
(a) Popliteus and ext. ligament
(b) *Popliteus and tibia*
(c) Biceps and ext. ligament
(d) Femur and gastrocnemius
Etio : (1) Trauma : (a) acute
(b) chronic prolonged
(2) Pathological joint
Clinic : (1) Firm, elastic, avoid swelling
(a) Hard and prominent on extension
(b) Soft, fluctuating and reducible on flexion
Treat : Excision
Compl : Affection of the joint

(C) Insertional bursæ :
(1) Between tendon and bone
(2) Between tendon and tendon

Anat: (1) Semitendinosus
(2) Gracilis
(3) Sartorius
Etio: (a) Trauma
(b) Tertiary syphilis
Clinic: Localized cystic swelling over the inner side of tibial head

(6) ACHILLIS BURSÆ:

Anat: Between: Tendon and bone
Etio: (1) Over exertion
(2) Bad boots
Clinic (1) Painful walking: dorsiflexion
(2) Cystic swelling on either side of the tendon
(3) Silky crepitus
Diff. diag: (1) Arthritis
(2) Osteomyelitis or periostitis
(3) Tenosynovitis
(4) Cellulitis
Treat: (1) Acute. Rest + heat + rubefacients
(2) Chronic: Excision

V. IMPORTANT POINTS

(1) Etiological factors in bursitis:
  (a) Trauma.
    (1) Acute
    (2) Chronic and prolonged
    (3) Friction. (α) internal bony prominence
    (β) external. occupational
  (b) Lymph sepsis
  (c) Tuberculosis, syphilis, gonorrhea, gout
(2) Remember the close association between a bursa and joint—bone—lymphatics
(3) Complications of bursitis
  (a) Cellulitis
  (b) Abscess
  (c) Arthritis
(4) Differential diagnosis of bursitis
  (a) Intermuscular abscess
  (b) Cold abscess
  (c) Arthritis
  (d) Osteomyelitis or periostitis
(5) Spasm of a muscle may be due to bursitis underneath
(6) Deep fluctuating swelling under a muscle, especially between a muscle and a bone:
  (a) ? Cold abscess
  (b) ? Bursitis

(7) Arthritis: all movements restricted
Bursitis: particular movement restricted

(8) Be very careful about asepsis in bursæ operations as infection may spread to a joint

(9) In bursitis: examine for joint effusion
In arthritis: examine all near-by bursæ

(10) Occupational bursitis:
(1) Parson's knee: pretubercular bursitis
(2) Housemaid's knee. prepatellar bursitis
(3) Weaver's bottom: tuber ischii bursitis
(4) Student's or miner's elbow: olecranon bursitis
(5) Codman's disease: subdeltoid bursitis
(6) Billingsgate hump: seventh cervical spine bursitis
(7) Bunion · first metatarsal head bursitis

(11) Most common causes of chronic bursitis:
(1) Occupational or adventitious or frictional
(2) Tuberculosis
(3) Syphilis
(4) Secondary to joints
(5) Secondary to acute septic bursitis

(12) Differential diagnosis of a bursal swelling
(1) Bursa
(2) Ganglion
(3) Cold abscess
(4) Aneurysm
(5) Encapsuled lipoma
(6) Caseating lymph gland

(13) Adventitious bursæ: find out underlying bone pathology or cause of external friction
(A) Bone: (1) Exostosis
(2) Pressure or friction
(3) Callus
(4) Angular ankylosis
(B) External friction. (1) Ill-fitting shoes
(2) Housemaid or Parson, etc.

(14) Injection treatment of chronic bursitis:
Tech: 20% formalin glycerine solution
Sites: (a) Prepatellar bursæ
(b) Olecranon bursæ
Ind: Chronic bursitis with effusion

↓ (2) **Sensory recovery:** Protopathic → Epicritic

↓ (3) **Motor recovery:** Involuntary tonus → Voluntary power

(C) TREATMENT OF NERVE INJURIES:

Indications for operative exposure:

(1) **Primary:**

(a) Open wound
(b) Suspected division

(2) **Secondary:**

(a) Late diagnosis

Time 3–6 weeks after healing of accidental wounds

(b) Infected wound.

Time: after control of sepsis

(c) Closed injuries:

Time: one week of non-improvement and appearance of R. D.

(3) **Late:** Interstitial neuritis

Preoperative preparation:

(1) Correct posture
(2) Physiotherapy
(3) Asepsis

Operative technic.

(1) Skin incision
(2) Exposure of the nerve trunk: above → below → local
(3) Electrical stimulation
   (a) Faradic response + *ve* after 2 M. normal
   (b) Faradic response — *ve* within 6 M: degeneration
   (c) Faradic response — ve after 6 M: Permanent damage
(4) Exposure of the lesion: isolation of the nerve, excision of the scar
(5) Treatment of the lesion
   (A) Nerve block syndrome
      (a) Complete. end-to-end suture
      (b) Incomplete neurolysis
   (B) Irritation syndrome.
      (a) Neurolysis
      (b) Intraneural injection of absolute alcohol
      (c) Resection with end-to-end suture
      (d) Periarterial sympathectomy

OPERATIONS ON THE NERVE INJURIES

(I) END TO END SUTURE:

Steps: (1) Exposure of the nerve lesion
- (2) Trim the nerve ends
- (3) Coaptation and suture of surfaces
  - (a) avoid torsion
  - (b) avoid tension
  - (c) sutures through the sheath only
  - (d) interrupted plain catgut, ooo,ooo
- (4) Preparation of nerve bed: fat, muscle, fascia, tunica

Manoeuvres to bring the nerve ends together without tension

(1) Posture

Nerve	*Position*
(a) Median:	arm: adduction
	elbow: full flexion
	wrist: full flexion
(b) Radial:	arm: adduction
	elbow: full flexion
	wrist: extension
(c) Ulnar:	
(1) behind the epicondyle:	arm: adduction
	elbow: extension
	wrist: flexion
(2) in front of epicondyle:	arm: adduction
	elbow: flexion
	wrist: flexion
(d) Brachial plexus:	head and shoulder approximation
(e) Sciatic nerve:	hip: hyperextension
	knee: full flexion

(2) Mobilization of the nerve trunk: isolation up and down
(3) Lengthening of motor branches by stripping
(4) Transposition to new bed
(5) Two stage operation
(6) Bone shortening

(II) NEUROLYSIS:

Tech: (1) Isolation of the nerve trunk from surrounding scar
- (a) Capsulectomy-neurolysis: external adhesions
- (b) Endoneurolysis: internal fibrosis

(2) Transposition and isolation at new surroundings

(III) OPERATIONS ON IRREPARABLE NERVE LESIONS:

Ind: (1) Gunshot injuries
- (2) Failure of two stage suture

(1) BRIDGE OPERATIONS:
- (A) Nerve inlay or graft: auto, homo, hetero
- (B) Nerve crossing:

Ind: Facial nerve: (a) Facial—hypoglossal
- (b) Facial—glossopharyngeal
- (c) Facial—accessory

(2) SUBSTITUTE NON-NERVE OPERATIONS: with indications

(A) Tendon transplantation: Radial nerve paralysis
(B) *Arthrodesis. Shoulder muscle paralysis*
(C) Tenodesis: Paralytic drop-foot
(D) Amputation · Persistent sores + impaired growth + flail limb

After-treatment.

(1) Encasement in plaster of Paris in the position of relaxation of nerve trunk for two weeks
(2) Gradual stretching of flexed joints · after two weeks
(3) Retention in the position of relaxation of paralysed muscles:

	Nerve	*Position*	*Splint*
(a)	Brachial plexus	Shoulder: abduction	Shoulder abduction splint
		Elbow. flexion	
		hand. physiological cock up	
		= { wrist dorsiflexion; fingers slight flexion; thumb abduction + extension }	
(b)	Radial	hand · physiological	cock up
(c)	Median	„ : „	nil
(d)	Ulnar	„ : „	nil
(e)	Sciatic	ankle right angle	right angle splint

(4) Nutritional treatment.

(a) heat. (1) dry
(2) moist (not in irritation syn)
(b) *massage*
(c) electrical stimulation: galvanic → faradic
(d) exercises active, passive, against resistance
(e) muscle re-education

Results of nerve suture.

	Nerve	*Result*	*Defect*
(1)	Radial	Best	
(2)	Ulnar	(a) Bad for finer professions (b) Good for laborious professions	{ epicritic sense intrinsic muscles'
(3)	Median	Bad	anæsthesia of index finger
(4)	Sciatic	Poor	{ anæsthesia of the sole, intrinsic muscles of the foot, irritation and trophic phenomena
(5)	Ext. popliteal	Good	walking apparatus required

Factors governing the results of nerve suture ·

(1) Pre-operative
(a) nerve affected: specialized
(b) infection
(c) time of operation: primary or secondary
(d) pre-operative treatment
(e) anatomical situation of the lesion. proximal better

(2) Operative:
- (a) degree of torsion
- (b) degree of tension
- (c) suitable bed
- (d) hæmostasis

(3) Post-operative ·
- (a) infection
- (b) after-treatment
- (c) co-operation of the patient

Causes of suture failure.
- (1) Failure of end to end apposition
- (2) Torsion
- (3) Infection
- (4) Intraneural fibrosis
- (5) Extraneural fibrosis

Stages of Recovery after a nerve suture:
- (1) Tinnel's sign: Percuss the nerve from below upwards → tingling at the level of regeneration
- ↓ (2) Trophic recovery: Disappearance of trophic phenomena
- ↓ (3) Sensory recovery: protopathic → epicritic ∴ at the end of third month
- ↓ (4) Motor recovery: depends on:
  - (a) distance of injury from the centre
  - (b) nature of muscular function

III. SURGICAL NEURITIS

(1) FRICTIONAL NEURITIS: (See under individual nerves)

Clinical varieties:
- (a) Brachial neuritis: Cervical rib
- (b) Ulnar neuritis: Tardy ulnar neuritis
- (c) Sciatic neuritis: Sciatica

(2) CAUSALGIA:

Def: Inveterate and ever ascending irritation syndrome due to ascending interstitial neuritis as a result of sepsis in a sensory area

Etio: (a) Septic focus
(b) Infected wound

Path: (1) Ascending interstitial endoneuritis
↓ (2) Compression of nervi nervorum
↓ (3) Ascending irritation syndrome

Clinic: Paroxysmal neuralgia, hyperæsthesia, paræsthesia trophic changes

Sites: (1) Median
(2) Posterior tibial

Treat: (1) **Periarterial sympathectomy**
(2) **Sympathetic ganglionectomy**
(3) **Forster**: Posterior root resection
(4) **Spiller**: Anterolateral tract resection

IV. NEW GROWTHS OF THE PERIPHERAL NERVES

(1) NEUROFIBROMA:

Def: New growth of the connective tissue sheath of a nerve

(A) SOLITARY NEUROFIBROMA:

Perineurial fibroma

(1) **Painful subcutaneous nodule**

Path. Neurofibroma of a sensory nerve end
Clinic: Painful nodule with neuralgia

(2) **Peripheral nerve trunk neurofibroma:**

Clinic: (*a*) Paræsthesia + neuralgia
(*b*) Situation along the nerve course
(*c*) Lateral mobility more than long axis mobility

(B) GENERALIZED NEUROFIBROMATOSIS: VON RECKLINGHAUSEN:

Etio. Hereditary and familial
Path: (1) Congenital dysplasia Status dysraphicus
↓ (2) Endoneurial fibromatosis
Nervefibrils run through the substance of the tumor

Clinic (1) NEUROLOGICAL MANIFESTATIONS:

(A) **Cutaneous neurofibromatosis:**
Molluscum fibrosum

(B) **Multiple peripheral trunk neurofibromata**

(C) **Central neurofibromatosis:**
(1) **cranial**: dural, choroidal, accoustic
(2) **spinal**
(3) **sympathetic**: ganglia and nerve

(D) **Ocular neurofibromata**: Phakomata

(E) **Generalized neurofibromatosis:**
Diffuse and irregular thickenings with nodular tumour like swellings along the course of nerves

(F) **Plexiform neurofibromatosis:**
Conglomeration of tortuous, convoluted, thickened and elongated nerve cords with pendulous skin folds

Sites: (1) Head and neck: subcutaneous
(2) Extremities: nerve trunks
(3) Abdomen: autonomic plexuses

(G) **Elephantiasis neuromatosa:**
Enormous thickening of skin and subcutaneous tissues with generalized and plexiform neurofibromatosis of an extremity

(2) CUTANEOUS MANIFESTATIONS:
Pigmentary
(A) Uniform bronzing
(B) Vitiligo patches
(C) Freckling
(D) Pigmented patches. Cafe-au-lait
(E) Pigmentary hyperplastic patches
(F) Nævi
(G) Blue spots: early skin neurofibromata

(3) SKELETAL MANIFESTATIONS:
(A) Spinal curvature
(B) Exostoses
(C) Thinning of bones
(D) Osteoporosis
(E) Osteomalacia
(F) Proliferative joints
(G) Spontaneous fractures

(4) DEVELOPMENTAL MANIFESTATIONS:
Spina bifida, meningocele

(5) ENDOCRINE MANIFESTATIONS:
(A) Pituitary.
(*a*) acromegaly
(*b*) hypopituitarism
(B) Adrenal dysfunction
(C) Thyroid dysfunction
(D) Sexual gland dysfunction

(6) PSYCHICAL MANIFESTATIONS:
. Subnormal intelligence

Clinical forms: (A) Complete
(B) Incomplete

Compl: (1) Deformity
(2) Sequelæ of different manifestations
(3) Sarcoma; malignant melanoma

(2) SARCOMA OF A NERVE:

Etio: Generalized neurofibromatosis
Path: Early metastases in lung, liver, lymph glands

Clinic: (a) Sudden and **rapid growth** of a neurofibroma
(b) Severe neuralgia
(c) Pressure paralysis
(d) Signs and symptoms of secondaries

(3) STUMP NEUROMA:

Def: Fusiform swelling at the end of a divided nerve
Etio: (1) Failure to cut a nerve short in amputations
(2) Infection in amputation wound
Path: Coiled nerve fibres surrounded by fibrosis
Clinic: Painful and tender swelling near the end of an amputation stump
Compl: (1) Adherent scar
(2) Painful glossy stump
(3) Amputation neuralgia
(4) Phantom limb
(5) Causalgia
Treat: (1) Preventive: Cut nerves short in amputations
(2) Curative. Excision

AFFECTIONS OF SPECIAL NERVES

(I) CRANIAL NERVES:

(1) OLFACTORY:

Etio: (a) Trauma. fracture ant. fossa
(b) Endothelioma
Clinic: Anosmia

(2) OPTIC:

Etio. (a) **Trauma**: orbital
(b) **Thrombosis** cavernous sinus
(c) **Tumours**: endothelioma
(d) **Aneursysms**: arteriovenous
(e) **Pressure**: pituitary
Clinic. (1) Blindness
(2) Homolateral pupillary reflex present

(3) OCULOMOTOR:

Etio: (a) Trauma
(b) Thrombosis: Cavernous sinus
(c) Tumour
(d) Aneurysm. Circle of Willis
(e) Pressure
Clinic: (1) Ptosis
(2) Proptosis
(3) Ophthalmoplegia
(4) Mydriasis
(5) Loss of accommodation
(6) External strabismus

(4) TROCHLEAR:

Etio: As in oculomotor
Clinic: Internal strabismus

(5) TRIGEMINAL:

Etio: (a) **Trauma:** *fractures*
(b) **Tumours:** Accoustic, nasopharyngeal
(c) **Aneurysm:** Internal Carotid
Clinic: partial or complete trigeminal anæsthesia
(d) **Sepsis:** teeth, air sinuses
(e) **Neuralgia:**
(1) **Major** (tic douloureux): idiopathic
(2) **Minor:** peripheral sepsis
(3) **Pressure:** growths
(4) **Herpetic**

TRIGEMINAL MAJOR NEURALGIA

Def: Chronic progressive severe paroxysmal attacks of acute stabbing pain along one or more divisions of the nerve without any sensory or motor loss, there being absolutely no evidence of any organic cause

Clinic: (1) *Periodic, intermittent and recurring outbursts* of darting pain with hyperæsthesia in the trigeminal field
(2) **No reduction of sensory or motor function**
(3) **No peripheral reflex focus**
(4) Local start with a progressive nature

Treat:

(1) INJECTION OF 1-2 c.cs. OF 80-90% ALCOHOL:

Tech: (a) Anæsthesia: local
(b) Introduction of needle into the ganglion or nerve trunk
(α) saline syringe: *to test resistance*
↓ (β) novocain syringe: regional anæsthesia
↓ (γ) alcohol syringe

(A) **Gassian ganglion or Mandibular trunk at F. Ovale**

(1) **Harris: Lateral route:**

Site: (a) Lower border of the zygoma one inch in front of anterior root, between coronoid and condyloid processes of the mandible
or, (b) Intersection of
(α) line from incisura of the ear to lower border of ala nasi and
(β) perpendicular one inch anterior to middle of external auditory meatus

or, (c) ½ inch in front of and below the zygomatic eminentia articularis
Direction: Inwards with backward and upward inclination
Landmark: Pterygoid lamina at the depth of 4 cms.
Depth: 5 cms.

(2) **Stewart — Hartel: Anterior route:**

Site: (a) Through nasolabial fold opposite 2nd or 3rd molar
or, (b) 2 cms. external to the angle of the mouth
Direction: (1) Backwards and upwards and inwards
or, (2) 15° with sagittal plane; 135° with upper jaw
or, (3) **Aim at pupil**
Landmark: Base of the skull

(B) **Maxillary nerve at F. rotundum**

Site. Join the line between:
(a) Angle of anterior border of coronoid with the malar
& (b) Sharp bend of the frontal process of malar
Site: Push the needle at (b)
Direction: Inwards and upwards 40° in the above-mentioned line
Depth: 5 cms.

Complication of alcohol injection:
(1) **Failure of approach**
(2) Injury to internal max. art.
(3) Injury to eustachian tube
(4) Injury to pharynx
(5) Subarachnoid injection of alcohol
: paralysis of 6th, 7th and 8th nerves
(6) Temporary masticatory paralysis
(7) Ophthalmic complications:
(a) **loss of corneal reflex**
(b) diplopia
(8) Headache
(9) Vomiting

Result: Anæsthesia and relief from pain for 6 months to 2 years

(2) OPERATIVE TREATMENT:

(A) PERIPHERAL OPERATIONS: RESECTION OR AVULSION
(1) Supraorbital: Incision along supraorbital margin with notch as centre
(2) Infraorbital: Incision along infraorbital margin
(3) Inf. alveolar: Transverse incision over ramus of mandible
↓ Trephine ramus behind the notch

(B) INTERMEDIATE OPERATIONS.
(1) Resection of 2nd and 3rd divisions
(2) Partial resection of the ganglion

Tech : (1) Temporal scalp flap incision
(2) Trephine : in the angle between anterior and posterior branches of Mid. Mening. Art.
(3) Excision of the bone
(4) Separation of dura : from the cranial base upto F. Ovale
(5) Identification of 3rd branch—ganglion—2nd branch
(6) Excision of the nerves or ganglion (spare ophthalmic part)
(7) Occlusion of F. Ovale and Rotundum

(C) CENTRAL OPERATIONS :

(I) RESECTION OF SENSORY ROOT Frazier · Hartley krause

(1) Frazier or Hartley krause : lateral approach
(a) Posture : Sitting in a dental chair
(b) Anæsthesia . Local and general
(c) Incision . (α) Zygomatico—temporal skin flap
(β) Inverted U-shaped musculo—aponeurotic flap
(d) Trephining the skull
(e) Separation of the dura from cranial base
(f) Ligature of Mid. Mening. Artery
(g) Plugging of Foramen Spinosum
(h) Identification of Gasserian ganglion
(i) Incision of the dural sheath of the ganglion
(j) Retraction and division of sensory root

(2) Dandy's occipital approach

(II) SJOQVISTS' OPERATION · (Med. Ann. 1940. Page 342)

Object : Interruption of passage of painful stimuli to the Trigeminal nucleus

Tech : (a) Cerebellar exploration
(b) Lift up the cerebellar tonsil
(c) Horizontal cut 3.5 m.m. deep into Medulla Oblongata immediately above the Foramen Magendie

Result : Only pain sensation vanishes, leaving other sensations intact

Post-oper. compl :
(1) **Shock**
(2) **Hæmorrhage**
(3) Cerebral embolism
(4) Facial paralysis : Suture the lids
(5) **Corneal anæsthesia : keratitis**
(6) Masticatory paralysis
(7) Paræsthesia face
(8) Recurrence

(6) FACIAL:

(A) INTRACRANIAL COURSE:

(1) Supranuclear:

Etio: Injury; gumma; new growth
Clinic. (*a*) Lower face more affected
(*b*) Emotional *movements better than voluntary*
(*c*) Homolateral hemiplegia

(2) Nuclear:

Etio· Hæmorrhage; thrombosis
Clinic (*a*) Abducens paralysis
(*b*) Taste and hearing unaffected
(*c*) Crossed hemiplegia

(3) Infranuclear:

Etio. Cerebello-pontine tumour
Clinic *Involvement of auditory nerve and cerebellum*

(B) CRANIAL COURSE:

(1) Canalis facialis of Petrous:

Etio (*a*) Skull Fracture base
Callus
Hæmorrhage
(*b*) Ear **Chronic otitis media**
Mastoid operation

(2) Petrosal part of Petrous:

Etio (*a*) Skull Fracture base
Callus
Hæmorrhage
(*b*) Operations on Gasserian ganglion
Clinic Special features
(*a*) Loss of taste chorda tympani
(*b*) Hyperacusis stapedius
(*c*) Palatal paralysis: petrosal

(C) EXTRACRANIAL COURSE:

(1) Stylomastoid foramen:

Etio **Bell's palsy**: Tetanus

(2) Peripheral course:

Etio. **Parotid:**
(*a*) Malignancy
(*b*) Operative incision

(3) Branches:

Etio: Injury: accidental or operative
Clinic. Of extracranial facial nerve
(*a*) Facial palsy of peripheral type
(*b*) Asymmetry of face even when at rest

Bell's Palsy :

Def : Unilateral rapid facial palsy due to exposure neuritis

Etio : (a) Compression in the stylomastoid foramen due to nerve sheath œdema caused by exposure neuritis

(b) Geniculate ganglion herpes

Clinic : Facial palsy of peripheral type

Treat : (A) **Face :**

- (a) **Support of muscles** by
  - (α) elastoplast
  - (β) fascial grafts
- (b) Physio and electro-therapy

(B) **Nerve :**

- (a) **Suture**
- (b) **Decompression :** Ballance-Duel
  - . Removal of a part of mastoid process
- (c) **Crossing :**
  - (α) Hypoglossal
  - (β) Glossopharyngeal
  - (γ) Spinal accessory

Tech : (1) Incision : mastoid tip to hyoid cornu

(2) Exposure of facial nerve

(3) Exposure of donor nerve

(4) Anastomosis . Proximal end of donor nerve to distal end of facial

(5) Closure

- (d) **Graft :** where a portion is missing

(7) ACCOUSTIC :

Etio . (a) Fracture skull middle fossa

(b) Auditory neurofibroma

Clinic : (a) Unilateral deafness

(b) **Bezold's triad :**

- (1) Weber's test :
  - : Fork on vertex heard by healthy ear
- (2) Rinne's test
  - : Air conduction more than bone conduct.
- (3) Gelle's test ·
  - : Bone conduction less on meatal air compression

(c) Schwabach test :

- · Diminished bone conduction

ACCOUSTIC TUMOUR : Cerebello-pontine tumour

Source · Accoustic nerve sheath

Site : Internal accoustic meatus

↓ Cerebello-pontine angle

Path : Slow, benign, encapsuled fibroma of nerve sheath

Clinic: (*a*) Pressure on accoustic nerve: unilateral deafness
(*b*) Pressure on neighbouring nerves: 5, 6, 7
(*c*) Pressure on cerebellum: ataxia and nystagmus
(*d*) Internal hydrocephalus: increased intracranial pressure
(*e*) Other signs of neurofibromatosis

(8) GLOSSOPHARYNGEAL:

(A) **Trauma:**

Etio: Fracture base
Clinic: Dysphagia
Trophic ulcer of the tongue

(B) **Neuralgia:**

Def. Neuralgic pain in the tonsil → root of the tongue→ ear
Etio (*a*) Primary
(*b*) Secondary to carcinoma tongue or tonsils
Treat: (1) Neurectomy. at Jugular foramen through Posterior fossa
(2) Extracranial avulsion

(9) VAGUS:

Etio. (1) **Injury:** Fracture base skull; Inclusion in ligature
(2) **Pressure:** Tumours. malignant
Aneurysms
T. B glands
Clinic (1) Tachycardia
(2) Intractable cough
(3) Hoarse voice. paralysis of vocal cord
(4) Dysphagia paralysis of palate and pharynx

(9A) RECURRENT LARYNGEAL NERVE:

Etio. (1) **Thyroid:**
(A) Operations. traction, ligature, section, œdema
(B) New growths: Carcinoma
(2) **New growths:** Thyroid, œsophagus, mediastinum
(3) **Aneurysm:** Aorta, Subclavian, Innominate
(4) **Diphtheria**
(5) **Functional:** Whispering voice with normal cough

Clinic: **Changes in voice and Cough**
(1) Bilateral irritation: Stridor
(2) Bilateral paralysis: Aphonia
(3) Unilateral irritation: Dry, brassy cough
(4) Unilateral paralysis: Monotonus hoarse voice

(10) SPINAL ACCESSORY :

Etio : (1) Fracture base skull
(2) **Malignant glands neck**
(3) **Operations on neck**

Path : (1) Anterior triangle :
Paralysis of sternomastoid and trapezius
(2) Posterior triangle :
Partial paralysis of trapezius

Clinic : (1) Drooping shoulder
(2) Wasted sternomastoid and trapezius
(3) **Deficient elevation of abducted arm**

Sequela : Cervical rib syndrome
Treat : Primary suture

(11) POSTERIOR LACERATE FORAMEN SYNDROME :

Etio : Fracture cranium : posterior fossa
Meningitis : gummatous
Tumours : malignant

Clinic : Paralysis of 9th, 10th and 11th nerves

(12) HYPOGLOSSAL :

Etio : (1) Intracranial : glosso - labio - laryngeal palsy
(2) Cranial . gumma or new growth
(3) Cervical :
(*a*) Tumours
(*b*) Operations

Clinic : (1) Hemiatrophy of the tongue
(2) Deviation of the tongue to the same side

(II) PERIPHERAL NERVES :

(1) PHRENIC NERVE :

Anat : 3rd, 4th and 5th cervical
Etio : (1) Malignant tumours
(2) Operative injury
(3) **Deliberate avulsion**

Clinic : (1) **Elevation of the diaphragm :** one to three inches
(2) Paradoxical movements of the diaphragm
(3) Collapse and immobilization of lung base

PHRENIC AVULSION :

Ind : (1) **Pulmonary tuberculosis :**
(*a*) Basal lesions
(*b*) Alternative to pneumothorax
(*c*) Addition to pneumothorax
(*d*) Preliminary to thoracoplasty
(*e*) Addition to intercostal neurectomy
(*f*) Cough and hæmoptysis

(2) **Non-tuberculous lesions of the lung base**
  (a) Abscess lung
  (b) Bronchiectasis
(3) **Diaphragmatic hernia**
(4) **Diaphragmatic adhesions:** respiratory pain
(5) **Persistent hiccough**
(6) **Operations on œsophagus:** as a preliminary

Tech: (1) Horizontal 1" incision, 1" above clavicle
(2) Exposure of scalenus anticus
(3) Exposure of phrenic nerve
(4) Injection of the nerve with 10% novocain
(5) Clamp and divide below the anæsthesia
(6) Avulsion by traction and rotation: 10 cms.
(7) Resection of nerve to subclavius

If temporary results are required, crush the nerve

(2) BRACHIAL PLEXUS:

Anatomy. (1) Roots: 5c; 6c, 7c, 8c, 1T
(2) Trunks
  (a) Upper: 5c, 6c.
  (b) Middle: 7c.
  (c) Lower: 8c; 1T.
(3) Divisions.
  (a) *Anterior*
  (b) Posterior
(4) Cords.
  (a) Lateral ant. div. of upper and middle
  (b) Medial ant. div. of lower
  (c) Posterior: post div. of all
(5) Peripheral branches
  (A) Supraclavicular
    (1) From anterior divisions of nerve roots
      (a) Scaleni and long. colli: 5, 6, 7, 8c-
      (b) Phrenic. 5c.
      (c) Dorsalis scapuli: 5c.
      (d) Long thoracic 5, 6, 7c
    (2) *From trunks*
      (a) Nerve to subclavius 5, 6c.
      (b) Suprascapular 5, 6c.
  (B) Infraclavicular
    (1) Lateral cord
      (a) Lateral ant. thoracic. 5, 6, 7c.
      (b) Musculo-cutaneous. 5, 6, 7c
      (c) Lateral head median 5, 7c.
    (2) Medial cord:
      (a) Medial ant. thoracic 8c, 1T.
      (b) Medial antibrach. cut: 8c, 1T.

(c) Medial brachial cut: 8c, 1T.
(d) Medial head median: 8c, 1T.
(e) Ulnar: 7, 8c, 1T.

(3) Posterior cord:
(a) Upper subscapular: 5, 6c.
(b) Lower subscapular: 5, 6c.
(c) Axillary: 5, 6c.
(d) Thoracodorsal: 6, 7, 8c.
(e) Radial: 5, 6, 7, 8c, 1T.

Root supply:

(1) C 5: Flexors, Abductors, External rotators } of the shoulder
(2) C 6. (1) Adductors, Internal rotators } of the shoulder
(2) Flexors, Supinators } of the elbow
(3) C 7: (1) Extensors, Pronators } of the elbow
(2) Extensors of wrist and fingers
(4) C 8. Flexors of wrist and fingers
(5) T 1. (1) Intrinsic muscles of the hand
(2) Cervical sympathetic

Etio: (1) **Traction with rupture:**

(A) Upper
Indirect pull on the flexus caused by separation of shoulder from neck due to:
(a) Falls
(b) Birth traction

(B) Lower.
(a) Hanging with arms overhead
(b) Breech presentation with arms overhead

(2) **Pressure:**
(a) Dislocation shoulder
(b) Malignant infiltration

(3) **Friction:** Cervical rib
(4) **Incision:** Accidental or operative
(5) **Laceration**

Clinic:

(1) COMPLETE LESION:

(A) Complete anæsthesia of the upper limb:
Except: (a) Supracromial
(b) Intercostobrachial

(B) Complete paralysis of the upper limb
Except: (a) Serratus anterior
(b) Rhomboids

(2) UPPER LESION: ERB-DUCHENNE: 5 & 6 C.

(A) Sensory: anæsthesia over the outer side of the arm
(B) Paralysis:
  (a) Arm: external rotators
      abductors
  (b) Forearm: flexors
      supinators
(C) **Deformity: Tip position:**
  (a) Arm: internal rotation
      adduction
  (b) Forearm: extension
      pronation

(3) MIDDLE LESION: in addition to Erb-Duchenne

(A) Paralysis:
  (1) Erb-Duchenne
  (2) Extensors of wrist and fingers
(B) Deformity.
  (1) Tip position
  (2) Flexion of wrist and fingers

(4) LOWER LESION: ARAN-DUCHENNE: 8 C; 1 T.

(A) Sensory. Inner side of forearm and inner $1\frac{1}{2}$ fingers
(B) Paralysis:
  (a) Flexors of wrist and fingers
  (b) Intrinsic muscles of the hand
(C) **Deformity: Wasted claw hand**

(5) KLUMPKE SYNDROME: C8; T1; cervical symp.

(A) **Aran-Duchenne**
\+ (B) **Horner's syndrome**
  Myosis
  Enophthalmos
  Ptosis: narrowing of the palpebral fissure
  Anhidrosis of face and neck
  Loss of cilio-spinal reflex

(6) INTRA OR EXTRA DURAL ROOT INJURIES:

Special signs:

(a) Paralysis of serratus mag. and rhomboids
(b) Anæsthesia over upper scapula
(c) Pain prominent
(d) Protopathic loss more than epicritic
(e) Horner's syndrome
(f) Cord symptoms:
  (α) Spastic paralysis
  (β) Dissociation of sensations
(g) Blood-stained C. S. F.

Treat:

(1) EXEPCTANT:

Ind: (a) Subcutaneous injuries which improve automatically
(b) Intra or extra dural rupture

Tech: (1) **Splinting:** in the position of the function of paralysed muscles
(2) Physio and electro-theraphy

Erb-Duchenne: (a) Arm: right angled abduction + external rotation
(b) Forearm: right angled flexion + supination

(2) OPERATIVE:

Ind: (a) Traction injuries: birth
(b) Compression: rib
(c) Open injuries
(d) Contusion: dislocations

Time: Within 10 days

Contraind: (a) Late lesions
(b) High lesions

(A) Exploration and repair of Brachial plexus:

Tech:

Prep: (1) Skin preparation
(2) Splint or plaster shell: for post-operative relaxation of nerve

(1) Incision:
(a) Neck: Posterior border of sternomastoid → along clavicle
(b) Neck + axilla: (α) Oblique: sternomast. → coracoid
(β) Transverse: right angles to nerve trunks
(c) Axilla: Clavicle → ant. axillary fold → coracobrachialis

(2) Exposure of plexus and its branches:
(A) Complete plexus:
(a) Supraclavicular exposure of trunks (between scalenus ant. and medius)
↓ (b) Division of clavicle
↓ (c) Infraclavicular exposure of cords (between deltoid and pectoralis)

(B) Nerves:

Nerve	*Guide*
(1) Median	: Axillary artery → coracobrachialis
(2) Ulnar	: Axillary vein → axillary artery
(3) Radial	: Post. axillary wall → axillary art. and vein
(4) Musculocut.	: Coracoid → coracobrachialis

(3) Repair of the lesions:
(a) Neurolysis
(b) Resection and suture
(c) Primary suture

(4) Closure of the wound

Post-oper. treat.

- (1) Full relaxation of repaired nerves · one week
  - (a) Release the head: end of first week
  - (b) Release the arm: end of two weeks
- ↓ (2) Full relaxation of paralysed muscles. till recovery

(B) Other operations for Brachial plexus palsy

- (1) Arthrodesis of Shoulder: At right angles
  - Ind: Erb's palsy with strong forearm and hand
- (2) Transplantation · of flexors into extensors of wrist
- (3) Amputation ·
  - Ind · Total brachial plexus palsy with no recovery within 18 months

(2A) CERVICAL RIB:

Etio: (1) **Cervical rib:**

- (a) Complete rib
- (b) Half rib and half fibrous band
- (c) Whole fibrous band
- (d) Bony boss
- (e) Enlarged transverse process

(2) **Cervical rib syndrome:** against normal first rib

- (a) Post-fixed plexus
- (b) Shoulder depression · in
  - (α) Spinal accessory paralysis
  - (β) Occupational
  - (γ) Age, sex and decubitus

(3) **Scalenus syndrome**

Path: **Friction** against · (1) Cervical rib or its variations
- (2) Normal first rib
- (3) Scalenus anterior

of: the lowest trunk: (C8; T1)

Clinic: (A) NERVE TYPE:

Pressure or friction against nerves

- (1) **Sensory: Ulnar paræsthesia** & neuralgia
- (2) **Motor:**
  - Paralysis: abductor and oppeneus pollicis
  - ↓ intrinsic muscles of hand
- (3) **Deformity:**
  - **Thenar and hypothenar wasting**
  - ↓ Claw hand

(B) VASOMOTOR TYPE:

Pressure or friction against sympathetic

- (1) Difference in pulse on both sides
- (2) Pulse better in elevation than in depression
- (3) **Circulatory impairment** → gangrene

Diagnosis: **Neuromuscular or vascular symptoms and signs in the right hand of a female adult exaggerated by depression and relieved by elevation or abduction of the shoulder**

Diff. diag: (1) Syringomyelia
(2) Anterior poliomyelitis
(3) Spinal tumour
(4) Brachial plexus fibrosis
(5) Pressure: rib tumours
aneurysms
malignancy

Compl: (1) Deformity
(2) **Functional disability**
(3) Circulatory gangrene

Treat: (A) **Conservative:** Posture
Shoulder elevation exercises

(B) **Operative:**
(1) **Excision of the accessory rib** or its variations
(2) **Division of the scalenus anticus** from first rib
(3) **Excision of the first rib**

(3) AXILLARY NERVE:

Etio: Fracture dislocation shoulder

Clinic: (1) **Sensory:** Anæsthesia over the deltoid
(2) **Motor: Inability of shoulder abduction**
(3) **Trophic:** Deltoid wasting
(4) **Deformity:** Flat shoulder
Prominent acromion

Treat: (1) Support in right angled shoulder abduction
(2) Physio and electro-therapy

(4) LONG THORACIC NERVE:

Etio: (1) Toxic-infectious **neuritis**
(2) **Trauma:** Operations on:
(*a*) Glands axilla
(*b*) Carcinoma breast
(3) **Pressure:** Glands
(4) **Friction:**
(*a*) Scalenus medius: (swimmers)
(*b*) Abnormal first rib
(*c*) Excessive elevation of arm

Sites: (1) Supraclavicular: labourers; swimmers
(2) Axilla: glands, operation
(3) Junction of roots: abnormal first rib

Clinic: (1) **Motor:**
(a) **Inability to push forwards**
(b) Inability to raise the arm to vertical
(2) **Trophic:** wasting serratus anterior
(3) **Deformity: winging scapula**

Treat: (1) Primary suture
(2) Slinging the scapula:
(a) Fascial graft
(b) Pectoralis major

(5) RADIAL NERVE:

(A) AXILLA:

Etio. (1) **Fracture-dislocation** shoulder
(2) **Crutch**

Clinic: (1) **Sensory:** Outer part of the **dorsum of the hand**
(2) **Motor:** Inability to extend elbow, wrist, fingers
(3) **Deformity:** wrist drop

(B) MUSCULO-SPIRAL GROOVE:

Etio. (1) **Fracture:** humeral shaft
(2) **Pressure:**
(a) **Operation table**
(b) **Tourniquet**
(c) Saturday night
(3) **Traction:** operative
(4) **Intramuscular injections**

Clinic: (1) **Sensory: Ball of thumb**
(2) **Motor:** as in A: but triceps working
(3) **Deformity:** wrist drop

(C) POSTERIOR INTEROSSEOUS NERVE:

Etio: Fracture dislocation: upper end of radius

Clinic: (1) **Sensory: Nil**
(2) **Motor:** Paralysis of extensors of wrist and fingers
(3) **Deformity:** Wrist drop

Diff. diag. Lead palsy; Volkmann's contracture

Treat: (A) **Conservative:** Cock-up splint
(B) **Operative: Exposure and Suture**

Ind. (1) Penetrating wounds
(2) Communited fracture with nerve injury
: Fix the fracture → suture the nerve
(3) Closed injuries:
: Showing no recovery in 12–16 weeks

Tech: (1) Radial N:
- (A) Incision:
  - (a) Above and behind the deltoid insertion
  - (b) Beyond the ext. humeral epicondyle along the medial border of brachioradialis
- (B) Exposure:
  - (a) Infra-axillary:
    : Interval between axillary artery and vein
  - (b) Musculo-spiral groove:
    : Between long and inner head and below the outer head of triceps
  - (c) Below the musculo-spiral groove
    : Between brachialis and brachioradialis at the level of ext. epincondyle
- (C) Post-operative position:
  Upper arm . adduction
  Elbow: flexion
  Wrist: extension
- (D) Physiotherapy . at the end of two weeks

(2) Posterior Interosseous nerve·
- (A) Exposure and suture
  - (1) Incision: Dorsum forearm
    : Between radial extensors and ext. communis
  - (2) Exposure: Deep to supinator brevis
- (B) Tendon transplantation of Flexors into Extensors
  Ind: No regeneration in 9–12 months

(6) MEDIAN NERVE:

(A) AT THE ELBOW:

Etio: **Fracture-dislocations**: elbow
Tourniquet

Clinic: (1) **Sensory**: Volar side of the outer half of the hand and nail beds: outer 3½ fingers

(2) **Motor**: Paralysis of
- (a) **Pronators**
- (b) Outer flexors of wrist and fingers
- (c) Thenar muscles

(3) **Trophic**: Wasting of thenar eminence

(4) **Deformity**: Simian hand
- (a) Metacarpo-phalangeal extension
- (b) Pointing index
- (c) Thumb adduction and extension

(B) AT THE WRIST:

Etio: **Incised wounds**
Fractures

Clinic: (1) **Sensory:** As in (A)
(2) **Motor: Thenar muscle paralysis** only
(3) **Trophic:** Wasting of thenar eminence
(4) **Deformity:** Simian hand

Treat: **Exploration:**

Ind: (1) Closed injury: supracondylar fractures
(*a*) Immediate: great pain + total paralysis
(*b*) Delayed: no improvement in proximal muscles in five months
(2) Penetrating injuries:
(*a*) Immediate in all cases
(*b*) Dalayed neurolysis

Tech: (1) Exploration in upper arm
Incision: Antecubital fossa → ant. axillary fold along the brachial artery
Guide (1) Medial border of coracobrachialis
↓ (2) Median basilic vein
(2) Exploration at elbow and in the forearm
Incision: Inner side of biceps tendon
↓ antecubital fossa
↓ midline of the forearm
Guides: (1) Median basilic vein
↓ (2) Radial border of fl. carpi. radialis
↓ (3) Ulnar border of fl. carp. rad. tendon

Post-oper Elbow: full flexion
Wrist: flexion

(7) ULNAR NERVE:

(A) AT THE ELBOW:

Etio. (1) **Fractures:** Supracondylar
Internal condyle
External condyle
(2) **Dislocations**
(3) **Cubitas valgus or callus friction:**
Tardy ulnar paralysis
(4) **Operations:** Excision of the elbow

Path: (1) **Primary:** Recent trauma
(2) **Secondary:** Tardy ulnar paralysis
· Late traumatic interstitial attrition neuritis due to frictional fibrosis caused by cubitus valgus

Clinic: (1) **Sensory:** Inner 1½ fingers both sides
Ulnar border of the hand
(2) **Motor:** Loss of
(*a*) Flexion at basal joints
+ (*b*) Extension at phalangeal joints } of little and ring fingers

(c) **Intrinsic muscles of the hand**
: Adduction and abduction of all fingers
(d) Adduction of the thumb
(3) **Trophic:** Wasting of hypothenar and interosseous spaces
(4) **Deformity:** Claw hand: Main-en-griffe
(a) Metacarpophalangeal extension
(b) Interphalangeal flexion

(B) AT THE WRIST:

Etio: **Incised wound**
Fractures

Clinic: Same as in A: except no sensory changes

Treat:

(1) **Conservative:**

Ind: Partial lesions

Tech: Careful splinting of fingers in extension

(2) **Operative:**

(A) **Exploration:**

Ind: (1) Penetrating injuries: immediate suture
(2) Closed injuries:
(a) Immediate: suture
(b) Delayed: neurolysis
(3) Transposition

Tech: (1) Upper arm:
Incision: Behind the medial condyle → ant. axillary fold
Guides: Basilic vein
↓ Median nerve
↓ Internal intermuscular septum
(2) Elbow:
Incision: Inner side lower third of arm
↓ Behind the internal condyle
↓ Forearm
Guide: Internal condylar groove
Two heads of fl. carp. uln.
(3) Forearm:
Incision: Ulnar side of volar forearm
Guide: (a) Upper third:
: Two heads of fl. carpi. ulnaris
(b) Middle third:
: Ulnar artery
(c) Lower third:
: Interval between flexor carpi. uln. and flexor dig. sublimis

(B) Anterior transposition of ulnar nerve:

Ind: (a) Suture
(b) Tardy ulnar paralysis

(c) Recurrent dislocation of the nerve
(d) *Operative treatment of fracture median epicondyle*

Tech: (a) Exposure and isolation of nerve trunk
(b) Stripping up of motor branches
(c) Preparation of new bed:
: Common flexor origin in front of condyle
(d) Division of internal intermuscular sept.
(e) Transfer of the nerve to the new bed
(f) Closure

Post-operative Position
Arm: Adduction
Elbow: (a) Flexion: if transposition
(b) Extension: if no transposition
Wrist: Flexion

(8) TWELFTH DORSAL NERVE:

(A) **Neuralgia**:
Etio: Herpes zoster
Kidney operations
Long twelfth rib
Treat. Avulsion or division

(B) **Paralysis**:
Etio: ***Kidney operations***
Clinic. Post-operative lumbar hernia
Treat: Fascial hernioplasty

(9) ILIO-INGUINAL NERVE:

(A) **Neuralgia**:
Etio: Implication in a suture or a scar in **herniotomies**
Treat (1) *Under-cutting the scar*
(2) Division or avulsion of the nerve

(B) **Paralysis**:
Etio: **Gridiron incision** and drainage
Clinic. Post-operative direct inguinal hernia

(10) LATERAL FEMORAL NERVE:

Neuritis: **Meralgia Paræsthetica**
Etio. (a) Abdominal operations
(b) Rheumatism
Clinic: (1) Paræsthesia } in lateral femoral region
(2) Reduced sensibility } in lateral femoral region
(3) Tender spots } in lateral femoral region
Treat: (1) Novocain infiltration
(2) Resection or avulsion

(11) FEMORAL OR ANTERIOR CRURAL NERVE:

Etio: (1) Pelvis: fracture or growths
(2) Hip: dislocation
(3) Groin: wounds

(4) Psoas abscess
(5) Infantile paralysis

Clinic: (A) **Paralysis:**
(1) Sensory: Anæsthesia on medial side of foot, leg and thigh
(2) Motor: **Paralysis of extensor quadriceps**

(B) **Neuritis:**
(1) Pain and paræsthesia in leg, thigh and groin
(2) Painful impairment of knee extension: : Tripping, difficulty in walking
(3) Painful passive adduction, abduction and hyperextension of the hip
(4) Tenderness below the great trochanter

(12) OBTURATOR NERVE:

Etio: (1) **T. B. Hip**
(2) **Sacroiliac disease**
(3) **Pelvic growths:** Innocent and malignant : Prostate, rectum, cervix, bone
(4) **Obturator hernia**

Clinic: (A) **Neuralgia:**
: Pain on the inner side of knee and thigh

(B) **Paralysis:**
(*a*) Inability to press knees together
(*b*) **Inability to cross legs**

(13) GREAT SCIATIC NERVE:

(A) PARALYSIS:

Etio: (1) **Wounds:** Fractures, dislocations
(2) **Injections**
(3) **Tumours**
(4) **Postural or occupational**

Clinic: (1) **Sensory:** Complete anæsthesia below the knee except on the medial side
(2) **Motor: Complete paralysis below the knee** Weak flexion of the knee
(3) **Trophic:** Sore on the sole
(4) **Deformity:** Drop-foot

(B) SCIATICA:

Etio: (1) **Primary: Interstitial peripheral neuritis**
(*a*) Sub-acute non-articular rheumatism
(*b*) Diabetes
(*c*) Influenza

(2) **Secondary: Pressure or Friction:**
(*a*) Cord and meninges
(*b*) Spine and intervertebral foramen

(*c*) Nucleus pulposus extrusion
(*d*) Sacroiliac joint disease
(*e*) Pelvic abnormalities
(*f*) Hip joint abnormalities
(*g*) Gluteal tumours and fibrous bands
(*h*) Postural or occupational
(1) Driver's thigh
(2) Coal pickers
(3) Cross leg posture

Clinic: (1) **Neuralgic pain with tender spots**
(*a*) High or central type
(*b*) Low or peripheral type

(2) **Lasegue:**
(*a*) Flexion of the thigh upon the hip with flexed knee is painless
(*b*) Extension of the knee with thigh flexed on hip is painful in gluteal region

(3) **Hallux sign:**
Thigh and knee extension:
Pain in gluteal region on:
(*a*) Hyperflexion and extension of Hallux : Whole sciatica
(*b*) Hyperextension only of Hallux : Internal popliteal
(*c*) Hyperflexion only of Hallux : Peroneal

(4) **X-Ray:** Spine, pelvis, hip

(5) **Rectal Examination**

Treatment: (A) **Injection:**
(1) **Perineural:**
50 c.cs. saline after novocainization
(2) **Epidural Presacral:**
: 50 c.cs. of ·5% novocain
(avoid injury to the rectum)
(3) ***Heile's Paravertebral:***
100–150 c cs. of saline
Close to the side of 5L. vertebra
Vertically above the post. sup. iliac spine

(B) **Stretching:** Under anæsthesia
(1) Closed
(2) Open

(C) **Operation:**
Section of the small sciatic and internal cutaneous nerve behind the knee

Exposure of Great Sciatic Nerve

Ind: (1) Penetrating injuries
(2) Sciatica

Tech: Incision: Sacrosciatic notch
↓ Medial to trochanter
↓ Midline of the post. thigh
↓ Medial to biceps

Exposure: (1) Buttock:
: Beneath post. cut. nerve of the thigh
(2) Thigh:
: Between biceps and semitendinosus
↓ Lateral to semimembrinosus and medial to biceps

Post-oper.: (1) Fixation:
Method: Plaster of Paris
Extent: Upper thorax to middle of the leg
Position: Hip: hyperextension
Knee: full flexion
Time: Two weeks
(2) Mobilization: Flexion of the hip: after two weeks
Gradual extension of knee: after three weeks

(14) EXTERNAL POPLITEAL OR COMMON PERONEAL NERVE:

Etio: (1) **Fracture** or **excision** or **tumour** of the upper end of the fibula
(2) **Wounds**: Accidental: (biceps tenotomy)
Operative
(3) **Splint pressure:**

Clinic: (1) **Sensory**: Outer leg and dorsum foot
(2) **Motor**: Extensors and peroneals
(3) **Trophic**: Dorsum foot
(4) **Deformity: Paralytic talipes equinovarus**

Treat: (1) **Conservative:**
(*a*) Right angled splint
(*b*) Boot with iron and toe lifting—spring
(2) **Operative:**
Ind: Open injuries
Tech: Incision: along biceps tendon to fibular neck
Guide: biceps tendon

(15) INTERNAL POPLITEAL OR TIBIAL NERVE:

Etio: (1) **Popliteal aneurysm or growths**
(2) **Operative**: Wounds

Clinic: (1) **Sensory: Anæsthesia of the sole**
(2) **Motor**: Paralysis of calf and sole muscles

(3) **Trophic:** Sole
(4) **Deformity:** Paralytic talipes calcaneo-valgus

Treat: (1) **Conservative:** Splints and boots
(2) **Operative:** Exploration

Exposure of Tibial Nerve:

(A) Popliteal space:
Incision. Midline in popliteal space
Guide. Lateral to semimembranosus
Medial to peroneal nerve and plantaris

(B) Upper two-thirds of the leg:
Incision: Midline of popliteal space and calf
Guide: Deep to gastrocnomius, soleus and fascia

(C) Lower third of the leg:
Incision: Along the medial border of the tibia
Guide: Under the soleus
between flex. long. dig.
and
flex. long. hall

IMPORTANT POINTS

(1) **Main Etiologies of Nerve lesions:**

(1) *Olfactory: fracture ant. fossa.*
(2) Optic: pituitary pressure
(3) Oculomotor: pressure
(4) Trochlear: pressure
(5) Trigeminal: neuralgia
(6) Facial:
(*a*) Apoplexy
(*b*) Bell's palsy
(*c*) Fracture skull
(*d*) Otitis media
(*e*) Mastoid operations
(*f*) Parotid operations
(7) Recurrent laryngeal: aneurysm, new growths
(8) Spinal accessory: neck malignancy or operations
(9) Phrenic. avulsion
(10) Brachial plexus: traction or pressure.
(11) Axillary: dislocation shoulder
(12) Long thoracic: axillary operations
(13) Radial: fracture, crutch, tourniquet, operation table
(14) Median: fracture, tourniquet, wounds
(15) Ulnar: fracture, friction, operations, wounds
(16) Twelfth dorsal: kidney exposure
(17) Ilio-inguinal: gridiron incision: herniotomy
(18) Lateral Femoral: meralgia
(19) Femoral: infantile paralysis

(20) Obturator : pelvis or hip causes
(21) Great Sciatic : sciatica : pressure or friction
paralysis : injection or infantile
(22) Common Peroneal : neck of fibula
(23) Tibial : popliteal aneurysm

(2) **Diagnostic points of nerve palsies :**

(1) Olfactory : anosmia
(2) Optic : blindness
(3) Oculomotor : ophthalmoplegia + external squint
(4) Trochlear : deficient down and out movement of eyeball
(5) Trigeminal : loss of corneal reflex + anæsthesia face
(6) Abducens : internal squint
(7) Facial : facial paralysis
(8) Accoustic : unilateral deafness
(9) Glossopharyngeal : dysphagia
(10) Vagus : tachycardia + altered voice
(11) Accessory : inability to raise the shoulders
(12) Hypoglossal : deviation of the tongue to the same side
(13) Phrenic : paralysis and elevation of diaphragm
(14) Brachial plexus :
(*a*) Erb-Duchenne : upper lesion : tip position ;
no abduction of arm
(*b*) Aran-Duchenne : lower lesion : claw hand ;
intrinsic hand
muscles paralysed
(*c*) Klumpke : paralysis of intrinsic hand muscles
+ Horner's syndrome
(15) Long thoracic : deficient push + winged scapula
(16) Axillary : inability to abduct the arm to right angle ;
flat shoulder
(17) Radial : wrist drop with dorsal anæsthesia ;
inability to extend metacarpo-phalangeal jts.
(18) Median : wasted thenar eminence : ape hand ;
inability of flexion, abduction and apposition
of thumb
(19) Ulnar : wasted hypothenar : claw hand ;
inability of adduction and abduction of fingers
(20) Ilio-inguinal : post-operative direct inguinal hernia
(21) Femoral : inability to extend the knee
(22) Obturator : inability to cross the leg over the other
(23) Great Sciatic : drop-foot ;
paralysis below the knee
(24) Common Peroneal : paralytic equinovarus ;
inability to evert and dorsiflex the
foot
(25) Tibial : paralytic calcaneovalgus ;
anæsthesia of the sole ;
inability to invert and plantarflex

(3) **After-treatment of nerve suture:**

(A) Stage of Nerve relaxation: position of shortest course
(B) Stage of Joint correction:
(C) Stage of Muscle relaxation: position of paralysed muscle function
(D) Stage of Physiotherapy.

(4) **Results of nerve sutures:**

(A) (*a*) Radial best
(*b*) Peroneal: good with apparatus
(*c*) Ulnar: good for laborious professions; bad for finer professions
(*d*) Median bad for all professions: anæsthesia index ball
(*e*) Sciatic: bad: anæsthesia sole

(B) End results of nerve suture depend on
(*a*) Quantitatively: Number of axons permeating the denervated territory (apposition)
(*b*) Qualitatively Number of axons making accurate connections (absence of torsion)

(5) **Position after nerve operations:**

(*a*) Position of nerve relaxation: two weeks
↓ (*b*) Position of paralysed muscle relaxation

(6) Beware of hot-water bags and splints in anæsthetic limbs

(7) **Indications for nerve operations:**

(1) Immediate: open injuries with suspected division
(2) Delayed: closed injuries with paralysis not improving within ten days
(3) Late: interstitial neuritis

(7A) The position of nerve trunk relaxation is *different from* position of paralysed muscle relaxation

(8) The sequence in **nerve regeneration** is
(*a*) Tinnel's sign
↓ (*b*) Trophic recovery
↓ (*c*) Sensory recovery: (α) protopathic → (β) epicritic
↓ (*d*) Motor recovery

(9) The rate of nerve regeneration is roughly 1 mm. a day

(10) **Von Recklinghausen's disease:**

(*a*) The disease is a congenital dysplasia
(*b*) The multifarious physical signs develop slowly and one type may antedate others by many years
(*c*) The disease is hereditary and familial
(*d*) Common incomplete forms of the disease are:

: (1) Dermatological changes
(2) Bilateral auditory tumours
(3) Multiple neuro-fibromata
(4) Plexiform neuro-fibroma

(11) Sepsis and involvement of the nerve in the scar are the most common causes of painful stump

(12) **Trigeminal neuralgia:**

(*a*) Diagnosis:
(1) Paroxysmal attacks
(2) Periodicity
(3) No sensory or motor disturbance
(4) No peripheral cause

(*b*) Alcohol injection into ganglion
(1) Early cases
(2) Very severe cases
(3) Old debilitated patients

(*c*) Section of the sensory root
(1) Late and intractable cases
(2) General good health
(3) Failure of injection

(*d*) Disadvantage of alcohol method is the temporary nature of the relief

(*e*) There are only two most common methods of treating trigeminal neuralgia
(1) Alcohol injection into the ganglion
(2) Section of the sensory root

(*f*) Facial paralysis after the section of the sensory root is due to traction on the great superficial petrosal nerve in the process of stripping dura from the base of the skull

Eyelids should be sutured, till the face recovers

(*g*) Measures according to severity and surity
(1) Alcohol injection
↓ (2) Peripheral neurectomy
↓ (3) Partial resection of ganglion or divisions
↓ (4) Resection of sensory root

(13) Alcohol injection into a proper branch or Gasserian ganglion or section of the sensory nerve root relieves the pain of inoperable malignant disease of the face, mouth and paranasal sinuses

(14) Most common causes of **facial paralysis:**

(*a*) Apoplexy
(*b*) Bell's palsy
(*c*) Otitis media
(*d*) Mastoid operation
(*e*) Parotid incisions

(15) *Injury to* **spinal accessory** may be a cause *of cervical rib* syndrome. The most common causes of its implication are:

- (a) Malignant glands neck
- (b) Operations on neck

(16) **Phrenic nerve avulsion** indications:

- (1) Basal lesions
- (2) Accessory and preliminary to collapse therapy
- (3) Diaphragm irritation

(17) **Brachial plexus lesions:**

(A) Clinic (a) upper: *arm closely hugs the trunk*
(b) lower. fingers motionless + claw hand
(c) Klumpke: lower brachial + Horner

(B) Contra-indication for exploration in brachial plexus lesions: high spinal rupture. as shown by:

- (a) Prominent pain
- (b) Anæsthesia over upper scapula
- (c) Horner
- (d) Some cord symptom

(C) Best time for exploration of brachial plexus is with-*in 10 days of injury with no signs of nerve recovery*

(18) **Cervical rib:**

(A) Etio: (a) Real cervical rib or its variation
(b) Post-fixed plexus: pressure of first rib or scalenus anticus
(c) Shoulder depression:

(B) Clinic. (1) Nervous type
(2) Circulatory type

(C) Symptoms and signs are relieved by elevation of arm

(D) *Operation will be beneficial if elevation of the arm* and its maintenance on an aeroplane splint relieves the symptoms

(E) Tenderness over the scalenus anticus insertion is present in scalenus syndrome

(19) Do not forget to test all the nerves going through a region in all closed and open injuries of the region especially in: (a) *Fracture dislocations*
(b) Open wounds

(20) Every case of humeral shaft fracture
: Test the radial nerve

(21) Every case of shoulder injury
: Test all the nerves

(22) Try to save the twelfth dorsal nerve in kidney operations

(23) Take care of ilio-inguinal nerve in gridiron appendix incisions, which should never be drained

(24) Constant giving way of the knee or tripping over is a sign of femoral nerve palsy

(25) **Sciatica:**

(*a*) Clinic: Hallux sign
(*b*) Exclude every possible cause of secondary sciatica
(*c*) Do not forget P. R. or P. V. examinations
(*d*) Exclude malignancy in sciatica of old people
(*e*) In obstinate cases, combined paravertebral and presacral routes are best for saline injections but do not exceed 160 c.cs. of saline
(*f*) Do not give alcohol injection into sciatic nerve
(*g*) Avoid injury to the rectum in presacral route

(26) Paralysis of common peroneal: paralytic talipes equino-varus

Paralysis of tibial: paralytic talipes calcaneo-valgus

CHAPTER V

BLOOD VESSELS, ARTERIES AND VEINS

I. CONGENITAL ANOMALIES

(1) Absence
(2) *Accessory arteries or branches*
(3) Anomalous origin
(4) Anomalous course

II. TRAUMA

Etio:

(1) **Penetrating Injuries:**

Effects: (*a*) **External** hæmorrhage
(*b*) **Internal** hæmorrhage
(*c*) ***Cellular*** *hæmorrhage: hæmatoma*

(2) **Non-penetrating or closed injuries:**

Effects: (A) **Contusion:**
(*a*) Thrombosis
(*b*) Aneurysm
(B) **Rupture:** hæmatoma

Compl: (1) Infection
(2) Pressure gangrene: indirect traumatic gangrene
(3) Infective gangrene
(4) Traumatic aneurysm

(3) **Hæmorrhage:**

Varieties: (1) **Etiological:**
(*a*) **Traumatic:** Accidental
Operative
(*b*) **Pathological:** Ulceration
Infiltration
Congestion
Varices

(2) **Anatomical:**
(*a*) Arterial
(*b*) Venous
(*c*) Capillary

(3) **Clinical:**
(*a*) External
(*b*) Internal
(*c*) Cellular: hæmatoma

(4) **Time:**
- (*a*) Primary
- (*b*) Intermediary or reactionary
- (*c*) Secondary

(*a*) **Primary hæm:** At the time of accident or operation

(*b*) **Reactionary hæm:**

Time: Within 36 hours

Causes: (1) Recovery from shock
(2) Establishment of collateral circulation
(3) Slipped ligatures

(*c*) **Secondary hæmorrhage:**

Time: 6 to 10 days after the cause

Cause: (1) Infection → softening + ulceration
(2) Sloughing → gangrene
(3) Malignancy

Clinic: (*a*) Small warning blood streak
↓ (*b*) Painless sudden gush of blood

Predisposers: **Blood diseases:**
- (*a*) Hæmophilia
- (*b*) Purpura
- (*c*) **Jaundice**
- (*d*) **Deficient coagulation**
- (*e*) High blood pressure

Clinic: (1) **General:**
- (A) Loss of fluid: **thirst**
- (B) Loss of hæmoglobin: **pallor**
- (C) Loss of R. B. Cs.: air hunger
- (D) Fall of B. P.: **shock**
- (E) Loss of vital functions: restlessness, amaurosis, tinnitus

(2) **Local:**

(A) **External:**
- (*a*) Arterial: bright red spurts from proximal end, stopped by proximal pressure
- (*b*) Venous: dark red continuous flow from distal end, stopped by distal pressure
- (*c*) Capillary: continuous ooze, with no bleeding point

(B) **Internal:**
- (*a*) **General signs of hæmorrhage**
- (*b*) **Signs of fluid in body cavity**
- (*c*) Signs of pressure on neighbouring structures

(C) **Hæmatoma:**
Def: Collection of blood in cellular tissues
Clinic: (a) **Local:** Rapidly increasing acute irregular swelling near the course of a large vessel after trauma
(b) **Distal:** Pressure signs:
Circulatory
Nervous
Visceral
Compl: (1) **Infection:** → suppuration → secondary hæmorrhage
(2) Pressure **gangrene**
(3) Traumatic **false aneurysm**
(4) Traumatic **arteriovenous—aneurysm**
Sites: (1) Scalp:
(a) Subcutaneous
(b) Sub-epicranial
(c) Sub-pericranial
(2) Eye
(3) Sub-periosteal: rib, mandible, tibia
(4) Scrotal: post-operative
(5) Popliteal:
Etio: Accidental hyperextension of the knee
↓
Path: Tearing of the vessel
Clinic: (a) Trauma
(b) Extreme pain
(c) Progressive stony hardness
(d) Loss of circulation in the leg

Treatment of arterial trauma: (with hæmorrhage)

(A) **Immediate:**
(1) **Arrest the bleeding:**
Tourniquet
Local pressure
(2) **Treat the shock:**
(a) Trendelenburg position
(b) Heat
(c) Morphia
(d) Fluids: water with glucose
saline
blood

(3) **Coagulants:**
Calcium
Blood serum
Blood transfusion

(B) **Deliberate:**

(1) **If seen within 6 hours of trauma:**
(*a*) Tourniquet
↓ (*b*) Exposure
↓ (*c*) Treatment of hæmorrhage or hæmatoma
↓ (*d*) Repair of tissues
↓ (*e*) Treatment of the artery
(α) Double ligature
(β) Arteriorrhapy

(2) ***If seen after some time after trauma***
(*a*) **If pulsation can be felt below the injury**
: Expose and ligature the artery after 4–6 days (collateral circulation)
(*b*) **If pulsation cannot be felt below the injury**
: Immediate exposure
↓ (α) Arteriorrhapy
or (β) Excision with Tuffier's tube or veingraft
or (γ) Ligature of the artery + ligature of the vein
(*c*) **If established gangrene or sepsis**
: Amputate

Treatment of hæmorrhage:

(I) **Primary Hæmorrhage:**

(1) ***Primary arterial compression***

(A) **First aid:**
(*a*) Digital compression
(*b*) Tourniquet:
(*c*) Esmarch's bandage and tube
(*d*) Lynn Thomas' forceps

(B) **Deliberate:**
(1) **Secure both the ends**
(2) Ligature main artery: in bleeding of
(*a*) Palm
(*b*) Sole
(*c*) Face and neck
(*d*) Skull
(3) Arterial suture: if artery is large

(2) **Primary Venous hæmorrhage:**

(a) No tourniquet
(b) Elevation
(c) Local pressure: by packs
(d) Ligature of distal or both ends

(3) **Primary Capillary hæmorrhage:**

(a) Local pressure: by packs or pads
(b) Hæmostatic applications
(c) Thermal applications
(d) Diathermy
(e) Suture apposition

(II) **Reactionary Hæmorrhage:**

(a) Prophylactic drainage
(b) **Avoid stimulants** during first 48 hours
(c) Light bandage and packs with elevation
(d) Re exposure and treatment of bleeding

(III) **Secondary Hæmorrhage:**

(1) Tourniquet
↓ (2) Plugging and compression **(Turpentine & BIPP pack)**
↓ (3) Cautery
↓ (4) Exposure and ligature of bleeding point
↓ (5) Ligature of main artery in continuity

Treatment of hæmatoma:

(A) **Operative:**

(1) **Exposure**
(2) Turn out the clot
(3) Treat the arterial injury

(B) **Conservative:**

(a) **Early:** Elevation — firm bandage
(b) **Late:** Fomentations dry—Pot. Iodide

III. ANEURYSM

Etio: (1) **Congenital:** Intracranial
Arterio-venous

(2) **Trauma:**

(a) Acute: false aneurysms
arterio-venous
(b) Chronic and recurrent

(3) **Pathological:**

(a) **Syphilis:** Spontaneous
(b) Atheroma: dissecting
(c) Embolic: mycotic
(d) Sepsis: periarterial

Varieties: (1) **Arterial:**
- (a) Saccular: trauma
- (b) Fusiform: syphilis
- (c) Dissecting: atheroma

(2) **Arterio-venous:**
- (a) Aneurysmal varix
- (b) Varicose aneurysm

(3) **False aneurysm:** Pseudo-sac of cellular tissue due to accumulation of blood, communicating with the arterial lumen.

(I) ARTERIAL ANEURYSMS:

(A) SPONTANEOUS ARTERIAL ANEURYSM:

Etio: Sex: male
Age: 40-60
Predisp: (a) Syphilitic **mesarteritis or atheroma**
+ (b) Intermittent **hypertension**
+ (c) Repeated **trauma**

Clinic: (1) **Intrinsic:**

An oval or round cystic swelling along the course of an artery with:
- (a) **Expansile pulsation**
- (b) Bruit
- (c) Thrill
- (d) Effect of proximal pressure on tension

(2) **Extrinsic pressure signs:**
- (a) Circulatory: weak pulse
  œdema
  gangrene
- (b) Nerve. sensory, motor, trophic
- (c) Bones: painful absorption
- (d) Viscera: dyspnœa, dysphagia etc.

Signs: (1) X-Ray
(2) Arteriography
(3) Positive Kahn
(4) Exploration

Diff. diag: (A) **Swelling under an artery:** Careful palpation

(B) **Swelling over an artery:**
- (a) Tension unaltered with proximal pressure
- (b) Disappearance of pulsation on altered position

(C) **Pulsating tumours:** Irregular consistency
Indefinite outline
Any position

(D) **Other causes:** Of deep seated pain

Compl: (1) Coagulation
(2) **Infection** → Inflammation → suppuration
(3) **Rupture** → Hæmorrhage: internal, external, cellular
(4) **Pressure**: On neighbouring tissues: **gangrene** paralysis

Treat: (1) **General:**
- (*a*) Treatment of syphilis
- (*b*) Treatment of hyperpiesia
- (*c*) Pot. Iodide; Calcium; 2% Sterile gelatin injections

(2) **Local:**

(A) **Operative**

- (*a*) **Ligature:**
  - (1) **Proximal:**
    - (α) Hunter
    - (β) Anel
  - (2) **Distal:**
    - (α) Brasdor
    - (β) Wardrope
  - (3) **Proximo-distal:** Pasquin

  Results: (α) Failure
  (β) Recurrence
  (γ) **Gangrene**
- (*b*) **Ligature and Excision** of the sac
- (*c*) **Matas' Endoaneurysmorrhapy** (from within the sac)
  - (1) **Obliterative:**
  - (2) **Restorative:**
    Ind: Saccular aneurysm · one communication
  - (3) **Reconstructive:**
    Over a rubber tube
    Ind: Fusiform healthy wa aneurysm
- (*d*) **Arteriovenous Anastomosis:** Babcock
- (*e*) **Acupuncture:** Needling
- (*f*) **Insertion of wiring**
- (*g*) **Amputation**

  Ind: (1) Gangrene
  (2) Hæmorrhage
  (3) Infection
  (4) Erosion with leakage

(B) **Conservative**—Proximal pressure:
Digital
Bands or Clamps

(B) TRAUMATIC ARTERIAL ANEURYSM:

Etio: (1) Subcutaneous contusion or rupture
(2) Penetrating injuries

Sites: Limbs, cranium

Path: (1) **True Aneurysm:**
: Stretched arterial scar
(2) **False Aneurysm:**
: Diffuse pulsating arterial hæmatoma, surrounded by fibrous wall, derived from the neighbouring cellular tissue

Clinic: (1) Same as spontaneous
(2) History of trauma
(3) Scar over the tumour
(4) No general disease

Treat: (1) **True traumatic aneurysm:**
(A) **Immediate:**
Ind: (*a*) Rapid blood extravasation
(*b*) Oncoming gangrene
(*c*) Relative asepsis
Tech: (1) Arrest of hæmorrhage
(2) Clear the extravasation
(3) Restoration or ligature of both ends
(B) **Delayed:** After circumscription and establishment of collateral circulation
Time: 3–6 months after trauma
Tech: As in spontaneous aneurysm
(2) **False Aneurysm:**
Tech: (*a*) Tourniquet control
(*b*) Evacuation of the clot
(*c*) Obliteration of sac by sutures

Special Aneurysms:

(1) AORTIC ANEURYSM:

Sites: (1) Thoracic
(2) Abdominal

Treat: (A) **Conservative:**
(*a*) Needling
(*b*) *Wiring:* with electric current
(*c*) Pressure by bands
(B) **Operative:**
(1) Ligature: (*a*) proximal
(*b*) distal
(2) Aneurysmorrhapy
(3) Babcock: arterio-venous anastomosis
: Cardiac ends of common carotid art. and int. jugular v. for aneurysm of thoracic aorta
(C) **Palliative: Paravertebral alcohol injections**

(2) INNOMINATE ANEURYSM:

Treat: (A) **Ligature:**
(*a*) **Distal:**
(α) Common carotid art.
↓ (β) Subclavian art.
(*b*) **Proximal:**
Post-compl: (1) Cerebral: tie common carotid first
(2) Gangrene arm
(B) **Arterio-venous anastomosis** of Babcock

(3) COMMON CAROTID ANEURYSM:

Treat: (A) **Distal ligature:**
(B) **Rapid occlusion:**
: (*a*) Ligature: proximo-distal (ext. car)
\+ (*b*) Excision or obliteration of the sac
(C) ***Gradual Occlusion:***
Ind: **age over 40**
Tech: bands, clamps

(4) INTERNAL CAROTID ANEURYSM:

(A) **Extracranial:**

Etio: Young people
Clinic: (A) **Intrinsic:**
(*a*) Nil
or (*b*) Peritonsillar swelling
or (*c*) Lateral pharyngeal swelling
(B) **Extrinsic:** Dysphagia, dyspnœa, trismus
Diff. diag: (1) **Peritonsillar abscess:**
(2) Pharyngeal abscess
(3) **Other causes of pressure symptoms**
Treat: **Ligature:**
(1) Internal carotid
or (2) Common and ext. carotid

(B) **Intracranial:**

Etio: Fracture skull
Congenital
Clinic: (1) **Noisy bruit**
(2) *Local pressure signs*
(3) General cranial pressure signs
Treat: **Ligature:** (1) Internal carotid
or (2) Common and ext. carotid

Post-compl: Cerebral: within two weeks

(5) EXTERNAL CAROTID ANEURYSM:

Treat: (1) **Excision:** After proximo-distal ligature
(2) **Ligature of common carotid artery**
Post-Compl: Cerebral

(6) SUBCLAVIAN ANEURYSM:

Treat: (1) **Ligature:**
- (a) Proximal
- (b) Proximo-distal
- (c) Innominate

(2) **Excision:** After proximo-distal ligature

Post-Compl: Gangrene arm

(7) AXILLARY ANEURYSM:

Compl: Œdema or gangrene or paralysis of upper extremity

Treat: **Matas' endo-aneurysmorrhaphy:**
- (a) Restorative
- (b) Obliterative

(8) ILIAC ANEURYSM:

Compl: Œdema, paralysis or gangrene of lower extremity

Treat: (1) **Ligature:**
- (a) Proximal
- (b) Distal
- (c) Proximo-distal

Compl: Gangrene

(2) **Endo-aneurysmorrhaphy:** Obliterative

(3) **Excision:** After proximo-distal ligature

(9) FEMORAL ANEURYSM:

Diff. diag: (1) Femoral hernia
(2) Saphenous varix
(3) Lymphadenitis
(4) Cold psoas abscess
(5) Psoas bursitis
(6) Lipoma
(7) Misplaced testis

Treat: (1) **Excision:** After proximo-distal ligature
(2) **Endo-aneurysmorrhaphy**

(10) POPLITEAL ANEURYSM:

Diff. diag: (1) Bursa
(2) Baker's cyst
(3) Varicose vein
(4) Abscess
(5) Lipoma

Compl: Pain, paralysis, œdema, gangrene of the leg

Treat: (1) **Ligature:** Of all kinds
(2) **Excision** with reconstruction of the artery
(3) **Matas** obliterative endo-aneurysmorrhaphy

Accessory treat:

+ Femoral arteriectomy + Femoral vein ligature

(11) GLUTEAL AND SCIATIC ANEURYSM

(A) **Extrapelvic:**
Treat: **Excision**

(B) **Intrapelvic:**
Treat: **Ligature of Internal Iliac**

(12) ANEURYSMS BELOW KNEE AND ELBOW:

Treat: **Excision**

(13) INTRACRANIAL ARTERIAL ANEURYSMS:

Etio: (A) **Congenital**
(B) **Acquired** or Pathological:
(*a*) Traumatic
(*b*) Arteriosclerotic
(*c*) Syphilitic
(*d*) Mycotic

Congenital intracranial arterial aneurysms:

Etio Age. Young
Side: Arteries of the base: Circle of Willis
Path Multiple, berry aneurysms
Clinic: (1) Recurring unilateral **migraine**
(2) **Focal signs:**
(*a*) Cranial nerve palsies. 3, 4, 6, 7, 8
(*b*) Trigeminal neuralgia. ophthalmic
(*c*) Cerebellar signs
(3) **General pressure signs:** If rupture
(4) **Special signs:**
(*a*) **Bruit** over the skull
(*b*) X-Ray
(*c*) Cerebral arteriography
: 10 c cs. of thorotrast into common carotid

Diag: **Relief of pain by compression on ipsilateral carotid artery**

Compl: (1) **Spontaneous rupture:**
Path: Subarachnoid hæmorrhage
Clinic: (1) **Meningeal irritation**
(*a*) Cervical tenderness: Kehrer
(*b*) Cervical rigidity
(*c*) Kernig
↓ (2) **Subdural compression:**
Unconsciousness
General signs of cranial pressure
Depressed vital centres
↓ (3) **Blood in C. S. F.**
(2) **Recurrent hæmorrhage:**

Treat: (1) **Congenital:**
- (a) **Dott:** Exposure and packing muscle graft
- (b) **Babcock:** Arterio-venous anastomosis: of
  - Cranial end of common carotid
  - Cardiac end of jugular vein

(2) **Pathological:**
Ligature of common carotid artery

(3) **Ruptured:**
- (a) Rest with sedatives
- (b) Intravenous hypertonic saline
- (c) Repeated lumbar punctures
- (d) Decompression

(II) ARTERIO-VENOUS ANEURYSMS:

Def: Abnormal communication between an artery and a vein, either direct or through an intervening sac.

Etio: (1) **Traumatic: Simultaneous trauma** to companion artery and vein (Bullet wounds)
(2) **Congenital:**
(3) **Spontaneous:** Rupture of an aneurysm into a vein

Varieties: (1) **Aneurysmal varix:**
: Direct arterio-venous fistula
(2) **Varicose aneurysm:**
: Sac between two vessels

Sites: (1) **Congenital:**
- (a) Lower limbs
- (b) Scalp
- (c) Pia mater

(2) **Traumatic:** Companion artery and vein at exposed sites
: Scarpa, popliteal, neck, axilla, antecubitum, cavernous sinus

Path: (1) **Vein:** Varicosity and arterialization
(2) **Artery:** Proximal dilatation
(3) **Communication:**
- (a) Fistula
- (b) Interposition of sac

(4) **Local circulation:**
- (a) Venous pulsation
- (b) **Venous stasis**
- (c) Arterial deficiency

(5) **Heart and circulation:**
: **Tachycardia** → hypertrophy → dilatation → decompensation

Clinic : (1) **History** : Congenital or traumatic

(2) **Site** :

(3) **Local** :

(a) **Aneurysmal varix** :

: Small **stationary** swelling with a thrill and a bruit in the course of an artery and a vein

(b) **Vericose aneurysm** :

Progressive, pulsatile, compressible tumour with thrill and bruit, and tension varying with proximal pressure, in the line of an artery and a vein

(4) **Distal** :

(a) **Varicosities**
(b) Skin malnutrition
(c) Hot and œdematous limb

(5) **Central : Tachycardia**

(6) **Branham sign** : → Good prognosis
: *Slow pulse on compression of the aneurysm*

Compl : (1) Malnutrition of the distal limb : **gangrene**

(2) **Cardiac embarassment**

Treatment : **Operative** :

Datachment or excision of the anastomosis
Time *3–6 months after trauma : to allow collateral circulation*

(1) **Ligature of the fistula**
Ind Small aneurysmal varix

(2) **Double ligature of the artery**
: With ligature of the vein
Ind : Small varicose aneurysm

(3) **Quadruple ligature of the artery and vein**

(4) **Quadruple Ligature**
: **With excision or obliteration of varicose aneurysm**
Ind : Big varicose aneurysm

(5) **Restorative procedure** :
Ind : (a) Large aneurysms
(b) Bad circulation

Tech : (1) Exposure
(2) Isolation of the sac with feeding vessels
(3) Temporary occlusion proximal and distal
(4) Removal of the sac
(5) Suture of the rents in artery and vein

Post-compl : **Gangrene** in the distal part of the limb

(A) CAROTIDO-CAVERNOUS ANEURYSM:

Etio: (1) **Trauma:** Fissured fracture cranial base
Gunshot wounds
(2) **Congenital**
(3) **Arterial disease:** Aneurysm

Clinic: (1) **Eye signs:** Pulsating exophthalmos
Ophthalmoplegia
Optic neuritis
Chemosis
(2) Subjective **Bruit**
(3) Pain—headache
(4) Anæsthesia of the face
(5) Dilated veins: orbital and frontal

Treat: (1) **Ligature:**
(a) Internal carotid
(b) Common carotid + External carotid
(c) Int. jugular vein
(2) **Dandy:** Intracranial distal occlusion of internal carotid by silver clips through frontal pituitary approach
Ind: Recurrence after carotid ligature

(B) CIRSOID ANEURYSM:

Etio. (1) Congenital
(2) Traumatic

Site: **Temporal and Frontal Vessels**

Path: Multiple arterio-venous communications

Clinic: (1) Mass of tortuous, dilated, pulsating vessels
(2) Constant humming bruit

Treat: (1) **Excision:** In small aneurysms
(2) **McNealy:**
(a) Ligature of external carotid
↓ (b) Ligature of main branches
↓ (c) Ligature of feeding vessels
↓ (d) Excision of the mass
Each step at the interval of one week

IV. THROMBOSIS AND EMBOLISM

(I) ARTERIAL THROMBOSIS AND EMBOLISM

(A) ARTERIAL THROMBOSIS

Etio: (1) **Primary:**
(a) Trauma
(b) Diseases of the intima:
Arteritis
Thrombo-angiitis
Arteriosclerosis
Atheroma

(2) **Secondary :** Arrest of an embolus

Predisp : (1) Infection : local or general
(2) Stasis
(3) Increased blood coagulability

Clinic : (1) Evidence of arterial disease
(2) Circulatory failure in distal part

Compl : (1) Necrosis
(2) **Gangrene**
(3) Ischæmia

Treat : (1) **Conservative :**
(*a*) Expectant
(*b*) **Heparin :** 10 units in 1 c.c. saline intravenous
(2) **Arteriectomy**

(B) ARTERIAL EMBOLISM :

Etio : Women between 30 and 40 years

Source : (1) **Left side of the heart :** 60%
Malignant endocarditis
Mitral disease
(2) Lung
(3) Aorta : atheroma

Sites : (1) **Constriction** of an artery :
Passage through a narrow space
Adductor canal
(2) **Bifurcations :** Aorta – common iliac – internal iliac – common femoral – popliteal
(3) **End arteries :** Brain

Clinic : (1) Organic heart lesion with systemic infection
(2) Sudden severe pain along an artery
(3) Peripheral limb : loss of circulation

Compl : (1) **Infarction :** Lung signs
(2) **Gangrene :**
Factors : (*a*) Secondary thrombosis in collaterals
(*b*) Reflex vaso-constriction
(*c*) Arteriosclerosis
(3) **Ischæmia**

Treat : (1) **Conservative :**
(*a*) Electric cradle, elevation, rest
(*b*) Intravenous **papaverine** hydrochlor, gr. ½ every 6 hours for 3 days
(*c*) Intravenous **heparin**

(2) **Operative:**

(A) **Embolectomy:**

Ind: (a) Lower limb
(b) Large artery
(c) Within 6 hours

(B) **Arteriectomy:**

Ind: (a) Small artery
(b) Late case: after 24 hours
(c) Damaged endothelium
(d) Impending gangrene
(e) Poor general health

(C) **Amputation:**

Ind: Established gangrene

(II) THROMBO-PHLEBITIS

Def: Inflammation of venous walls with thrombosis

Etio: (1) **Sepsis of the vein wall:**

(A) **Suppurative thrombo-phlebitis:**

(a) **Pylephlebitis:** In appendicitis
: Suppurative thrombosis of mesenteric and portal veins

(b) **Sinus-thrombosis** intracranial
(α) Lateral: in otitis media
(β) Cavernous: in carbuncle lip

(c) **Puerperal** thrombosis
(d) Acute osteomyelitis
(e) Septic wounds and injections

(B) **Specific non-suppurative thrombo-phlebitis:** Typhoid, pneumonia and influenza

(2) **Trauma:**

(a) Fractures
(b) Plasters and splints
(c) Operative
(d) Occupational: axillary thrombosis

(3) **Venous stasis:**

(a) Post-operative
(b) Post-convalescent
(c) Varicose veins

(4) **Altered blood:**

(a) Leukæmia
(b) Essential thrombophilia or thrombophlebitis migrans
(c) Familial phlebitis

(5) **Malignancy;** Melanoma malignum

Sites: (1) **Left femoral or saphenous**
(2) Internal jugular
(3) Intracranial sinuses
(4) Portal vein

Path: (1) Thrombosis
(2) Phlebitis
(3) Periphlebitis

Effects: (1) Proximal: embolism
(2) Local: obliteration
(3) Distal. venous obstruction

Clinic: (1) **Local:** Pain, tenderness and inflammatory **linear induration over a vein**
(2) **Distal:** Œdema, cyanosis, dilated veins
(3) **General:** Elevation of temp and pulse rate
(4) **Special:** Leucocytosis

Compl: (1) **Suppuration:** Pyæmia
(2) **Embolism:**
(*a*) Pulmonary
(*b*) Infarctive
(3) Congestive **œdema and hypertrophy** of distal limb
(4) Phleboliths

Prognosis: (1) Excellent: traumatic and superficial thrombosis
(2) Good: post-operative thrombosis
(3) Serious. suppurative thrombosis
(4) Hopeless: sinus thrombosis
pylephlebitis

Treat: (1) **Prophylactic:**
(*a*) **Early mobilization** + deep respiration
(*b*) Avoidance of etiology

(2) **Conservative:**
(*a*) **Complete rest** with elevation
· Until all signs disappear
(*b*) Leech–**Hirudin:** 10–15 leeches
(*c*) **Heparin:** Intravenous
(*d*) Massage and mobilization
: After 3 weeks

(3) **Ambulatory:**
Elastoplast strapping + ambulation
Ind: Superficial phlebitis

(4) **Operative:**
Ind: Acute pyogenic thrombo-phlebitis
Tech: (*a*) **Proximal ligature: Angular**
Iliocolic
Jugular

(b) Drainage of the vein
(c) Drainage of the primary focus
(d) Excision of the affected vein·

Some special forms of thrombo-phlebitis :

(1) TRAUMATIC AXILLARY THROMBO-PHLEBITIS:

Etio: *Muscular action*
Path: *Overstretching* or *contusion* of axillary vein against clavicle or rib
Clinic: (a) History of **muscular effort**
(b) Pain and disability of upper extremity
(c) Firm, hard, **cyanotic œdema of the limb**
(d) Tender, hard, **cordlike axillary vein** with dilated tributaries
Diag: Œdema of the arm after a muscular strain
Treat: (1) **Conservative**: Rest + elevation,
↓ Elastoplast + physiotherapy
(2) **Operative**: **Matas**: Excision of thrombosed segment

(2) THROMBO-PHLEBITIS OF THE LEG:

(A) DEEP:

(1) FEMORAL VEIN:

Etio: (a) **Post-operative**
(b) **Puerperal**
(c) Specific fevers
(d) Ascending
Site: Left femoral
Cause: (a) Oblique course
(b) Pressure of
(α) Rt. iliac. art.
(β) Sigmoid colon.

(2) TIBIAL VEIN:

Treat: **Elastoplast**: From toes to groin

(B) SUPERFICIAL:

(1) LONG SAPHENOUS VEIN:

Etio: **Varicose veins** and its injection treatment
Clinic: Local and distal signs
Treat: Firm **elastoplast** strapping
Moderate exercise

(2) EXTERNAL SAPHENOUS VEIN:

Treat: (a) Proximal ligature
(b) **Elastoplast**

(3) THROMBO-PHLEBITIS MIGRANS:

Essential thrombophilia

Clinic: Generalized and recurrent attacks of painful thrombo-phlebitis

Varieties: (1) **Primary**
(2) **Secondary**: Associated with thrombo-angiitis obliterans

(4) PERIPHLEBITIS:

Etio: Varicose Veins

Clinic: Painful non-suppurative cellulitis of the perivenous tissues

(III) BLOOD EMBOLISM

Def: Arrest of a foreign body circulating in the blood-stream, at a place in a vessel, leading to obstruction and consequent local and distal changes, according to its nature

Etio. (1) **Arterial and venous disease:**

Blood clot arteriosclerosis and atheroma thrombo-phlebitis

(2) **Trauma:**

- (a) Arterial or venous contusions: clot
- (b) Fractures. fat
- (c) Neck operations: air

(3) **Infection:** Pus or vegetations

- (a) Puerperal sepsis
- (b) Pyæmia
- (c) Septic endocarditis

(4) **Malignancy:** Malignant cells

Sarcoma
Malignant melanoma
Hypernephroma

Path: (A) **Nature of embolus:**

1. Thrombosis: blood clot
2. Trauma: air, fat, clot
3. Infection: pus, bacteria, vegetations
4. Malignancy: malignant cells
5. Mycotic: actinomycosis
6. Parasitic: filariasis

(B) **Factors:**

(1) **Local source:** Septic focus, thrombus
(2) **Foreign body:** Embolus:

- (α) Aseptic
- (β) Septic
- (γ) Malignant

(3) **Driving force:**
(a) Trauma
(b) Hyperpiesia
(c) Ambulation
(4) **Site of arrest:**
(a) End artery
(b) Constriction
(c) Bifurcation

(C) **Local changes:**
(a) Obstruction: thrombus
(b) Infection pus
(c) Infiltration: malignancy

(D) **Distal changes:**
(a) Acute softening: brain
(b) Acute ischæmia: retina
(c) **Infarction:** Spleen, kidney, lung
(d) Multiple abscesses: liver
(e) **Gangrene:** Limbs

(E) **Nature of the embolus:**
(a) Aseptic: obstruction
(b) Septic: suppuration
bacteræmia
(c) Malignant. infiltration

Clinic: (A) **Local:**
(1) Brain: paralysis
(2) Retina: blindness
(3) Spleen: painful enlargement
(4) Kidney: painful hæmaturia
(5) Mesentery: gangrene of the intestines
(6) **Lungs:** (a) Sudden death
(b) Pre-cordial pain + dyspnœa
(c) Infarction pneumonia
(7) **Liver:** Portal-pyæmia
Inflammatory enlargement with jaundice
(8) **Limbs:** Severe arterial pain → gangrene

(B) **General:** Toxæmia
Pyæmia
Septicæmia

(C) **Special:** Leucocytosis
Arteriography

Treat: (1) **Prophylactic:**
(A) Treatment of etiological conditions
(B) Gentle and **delicate handing** } of the [illegible]
(C) [illegible]

Prophylactic ligature of vein

(a) Aseptic thrombus
: Ligature on cardiac side
(b) Septic thrombus
: Ligature between the focus and the destination of its draining vein
(α) Angular
(β) Iliocolic

(2) **Conservative:**
(A) General treatment of etiology
(B) Symptomatic treatment
(C) Specific treatment
(D) Heparin in blood vessel diseases

(3) **Operative:**
(A) **Embolectomy** } See arterial embolism
(B) **Arteriectomy** }
(C) Operative **treatment of Primary focus:** After severance of its circulatory connection with general circulation

V. DEGENERATIVE ARTERITIS

Arteriosclerosis and Endarteritis

Etio: Senile males
(A) **Toxic states:**
(a) **Syphilis**
(b) Chronic nephritis
(B) **Metabolic:**
(a) **Diabetes**
(b) Gout
(c) Cholesteræmia
(C) **Infective:**
(a) Acute
(b) Chronic

Morb. anat: (A) **Endarteritis:**
Patchy endarteritis
↓ Intimal ulcerations
↓ (a) Patchy calcification and thrombosis (atheroma)
(b) Endarteritis obliterans
(c) Aneurysm
(B) **Mesarteritis:**
Generalized infiltration of muscle-coat
↓ Fibrosis
↓ Calcification of the media

↓ (*a*) Arteriosclerosis
(*b*) Hyperpiesia
(*c*) Aneurysm

Clinic : (A) **Prodromal :**

(*a*) Peripheral ischæmia
↓ (*b*) **Intermittent claudication :**
↓ (*c*) Arterial thickening with no pulse
(*d*) Hyperpiesia

(B) **Gangrene :** Arteriosclerotic dry gangrene

Diagnosis : (A) Vasodilator response test : negative
(B) X-Ray : calcified arteries
(C) Histamine wheal test

Treatment : (1) Treat the **etiological** factor

(2) **Prophylactic :**

(A) **Expectant :**

(*a*) Diet : abstinence from fat
(*b*) Protection and rest : local

(B) **Surgical :**

Ind : Threatening gangrene with peripheral pulse present

(*a*) **Ligature of femoral vein :** In Scarpa
(*b*) **Sympathectomy Periarterial :** Hunter's canal
(α) Alcohol injection
(β) Adventitiectomy
(*c*) **Arteriectomy :** Hunter's canal
(*d*) **Periarterial Sympathectomy + Vein Ligature** } Hunter's canal
(*e*) **Peripheral nerve block**

(3) **Curative :** Of gangrene itself

(*a*) **Dry dressings :** With elevation and protection.
(*b*) **Periarterial sympathectomy + Vein ligature**
(*c*) **Amputation :**

Ind : (1) Spreading infection
(2) Large area of gangrene
(3) Intractable pain
(4) General bad condition

Sites : (1) **Toes :** Minimal lesions
(2) **Mid-leg :** 6" below tibial tubercle
Ind : non-pulsating dorsalis pedis and post. tibial

(3) **Thigh**: 3" above knee
Ind: (*a*) No popliteal pulse
(*b*) Age over 60
(*c*) Poor general condition
(*d*) Rapid spread

VI. THROMBO-ANGIITIS OBLITERANS

Synonyms: (1) Presenile arteritis
(2) Juvenile arteritis
(3) **Buerger's disease**

Def: Presenile, non-syphilitic, chronic, occlusive, medium-sized arteritis with thrombo-phlebitis usually commencing in lower extremities

Etio: (1) **Men in middle thirties: 98% Jews**
(2) **Cigarette** smoking (Tobacco)
(3) ? Bacterial: communicable
(4) ? Vasospastic

Site: **Lower limb**: Unilateral → bilateral

Path: (*a*) Intermittent **vasospasm**
↓ (*b*) Continuous vasospasm
↓ (*c*) **Occlusive arteritis** and thrombosis
\+ ↓ (*d*) Thrombo-phlebitis migrans

Clinic: (1) **Prodromal**: Attacks of coldness + blanching + sweating
(2) **Intermittent claudication**:
: Fatigue and cramps on work
Relief by rest
(3) **Postural colour changes**:
· Angle of circulatory efficiency
(4) **Obliteration of Pulse**:
: (*a*) Intermittent: vasospasm
(*b*) Permanent · occlusion
(5) **Trophic**: onychia → gangrene
(6) **Thrombo-phlebitis Migrans**:

Clinical varieties: Brown
(1) Compensated type: with mild claudication
(2) Stationary type. with trophic ulcers
(3) Slowly progressive type: with relapses
(4) Acute progressive type: with gangrene

Sp. Signs: Arteriography

Treatment: (1) **Medical**:
: (A) Pavæx: passive vascular exercises
(B) Contrast baths: twice a day 45°–105°
(C) Heat: electric cradle
(D) Avoidance of cigarette

(E) **Intravenous therapy:**

(*a*) 5% hypertonic saline in recently sterilised distilled water: 150–300 c.cs. three times a week.

(*b*) Triple typhoid vaccine

(*c*) **Padutin:** (Bayer)

(2) **Surgical:**

Ind: Vasodilator response test positive

(A) **Temporary measures:**

(1) **Periarterial sympathectomy + Ligature of vein**

(2) **Local arteriectomy**

(3) Peripheral nerve crushing:

Site: 6 inches above the ankle
. anterior tibial; musculo-cutaneous; post. tibial nerves

(C) **Radical measures:**

(1) **Bilateral lumbar ganglionectomy**

(2) Suprarenalectomy

(3) **Amputation**

Ind: (*a*) Failure of conservation
(*b*) Spreading gangrene

VII. VASOSPASTIC DISEASES OF THE ARTERIES

(1) RAYNAUD'S SYNDROME:

Def: Intermittent pallor and cyanosis of the extremities brought on by cold due to **intermittent vasospasm of the digital arteries** and with lesions limited to the skin.

Etio: Neurotic women of 18—30

Causation. (*a*) Sympathetic neurosis
(*b*) Local arteriolar muscle sensitivity
(*c*) Unbalance between vaso-constrictor and vasodilator hormones brought either by blood, muscles or nerves

Clinic: (1) **'Prodromal chilly syndrome':**
Cold chilly hands

↓ (2) Intermittent attacks of vasospasm·
(*a*) **Local asphyxia**
(*b*) **Local syncope**

(3) Hyperhydrosis

(4) Pulse unaffected

Clinical types: (A) **Primary** Syndrome:

- (*a*) Normal persons exposed to cold
- (*b*) Inherited cold fingers
- (*c*) **True Raynaud's disease**
  : Essential arteriolar vasospasm
- (*d*) Post-traumatic
- (*e*) Sclerodactyly

(B) **Secondary:** To other vascular diseases

- (*a*) Thrombo angiitis obliterans
- (*b*) Arteriosclerosis
- (*c*) Syphilitic arteritis
- (*d*) Rheumatic arteritis
- (*e*) Cervical rib
- (*f*) General diseases

Compl: (1) **Digits:**

- (*a*) Anæmic ulceration
- (*b*) Onychia and paronychial whitlows
- (*c*) **Dry superficial gangrene**
- (*d*) Scleroderma and sclerodactyly
- (*e*) Decalcification of phalanges

(2) **Kidneys:** Intermittent hæmoglobinuria

(3) **Retina:** Intermittent blurring of vision

(4) **Brain cortex:** Paralytic symptoms

Diff. diag: (1) **Arteriosclerosis**

(2) **Thrombo-angiitis obliterans**

Treat: (A) **Medical:**

- (*a*) Warm climate. avoid cold
- (*b*) Fever therapy: mixed typhoid
  typhoid antigen
  dinitro-phenol

(B) **Surgical:**

Ind: (1) Early cases
(2) Progressive cases
(3) **Positive vasodilator tests**

Contraind: (1) Mild cases
(2) Stationary cases
(3) Improving cases
(4) Late cases
(5) **Negative vasodilator tests**

Operations: (1) Periarterial sympathectomy
: Temporary relief

(2) Ramisectomy: grey-rami
: Difficult and temporary

(3) **Sympathetic Ganglionectomy:**

(A) Stellate
(B) Lumbar: 2nd, 3rd, 4th.
: Results: (*a*) immediate: very good
(*b*) remote: good in mild cases

(2) ACRYOCYANOSIS:

Def: Prolonged attacks of cyanosis in peripheral parts due to arteriolar spasms

(3) ERYTHROCYANOSIS:

Def: Reddish brown discolouration of lower calf in stout women with subcutaneous hypertrophy in some cases
Path: Arteriolar spasm + Venous stasis
Treat: (1) Physiotherapy
(2) Bilateral lumbar ganglionectomy

(4) HYPERHYDROSIS:

Etio: Emotional young people
Path: Sympathetic dysfunction
Clinic: Attacks of profuse sweating of hands and feet
Treat: (1) Paravertebral alcohol injections into ganglia
(2) Ganglionectomy

(5) OTHER VASOMOTOR LESIONS:

Skin complications in:
(*a*) Infantile paralysis
(*b*) Pyramidal tract lesions
(*c*) Spinal cord injuries
(*d*) Rheumatic arthritis
(*e*) Causalgia
Treat: Sympathetic ganglionectomy
Ind: Novocain block test positive

VIII. VARICOSE VEINS

Def: Dilatation, lengthening, and tortuosity of Veins
Etio: (*a*) Women
(*b*) Familial
Cause: (1) **Primary:**
(*a*) **Congenital weakness of vein walls**
(*b*) **Gravity with valve failure**
(*c*) Lack of nerve tonus theory
(*d*) Endocrine theory
(*e*) New growth theory
(2) **Secondary:**
Obstruction to venous return
Path. Factors: (1) **Venous stasis:** gravity
(2) **Incompetence of valves:**

(3) **Changes in venous walls:**
(a) Congenial defects
(b) Phlebosclerosis and periphlebitis

Sites	*Primary*	*Secondary*
(1) **Œsophageal:**	—	+ : **Liver cirrhosis**
(2) **Rectum**	+	+ : Obstruction : local, regional, **liver**, heart, blood pressure
(3) **Varicocele:**	+	+ : **Malignant kidney**
(4) **Any veins:**	—	+ : Obstruction by pressure of tumours
(5) **Saphenous:**	+	+ . Obstruction by **gravid uterus** arteriovenous aneu. pelvic growths

PRIMARY SAPHENOUS VARICOSITY:

Etio: (a) Congenital weakness of walls
(b) Gravity with absence or incompetence of valves

Clinic: (1) Pain, fatigue, cramps
(2) **Dilated and tortuous veins** in the cyanotic œdeamatous and pigmented leg
(3) Saphenous varix in the femoral triangle

Signs: (1) **Incompetency of superficial veins:**
Trendelenburg:
(1) Horizontal position with leg raised
↓ (2) Pressure on saphenous opening
↓ (3) Vertical position
↓ (4) Sudden removal of pressure
↓ (5) Veins fill immediately from above down

(2) **Incompetency of communicating valves:**
(A) **Perthe:** Walk with blood pressure cuff at the root of the thigh
· Superficial veins emptied
(B) Raise the leg and empty the veins
↓ Constrict the root of the thigh
↓ Stand
↓ Veins fill up within 30 Sec.

(3) **Non-potency of deep veins:**
Elastic bandage from tœs to knee
↓ *Walk for half an hour*
↓ Discomfort

Diff. diag. of saphenous varix :
- (*a*) Femoral hernia
- (*b*) Saphenous lipoma
- (*c*) Cold abscess
- (*d*) Lymph gland abscess
- (*e*) Aneurysm : femoral or arteriovenous
- (*f*) Misplaced atrophied testis

Compl : (1) **Skin :**
Pigmentation
Pruritus
Eczema
Chronic ulceration
Malignancy
(2) **Sub-cut :** Œdema → elephantiasis
(3) **Veins :**
Thrombo-phlebitis → phlebolith—pulmonary embolism
Periphlebitis
Hæmorrhage
(4) **Bones :** Periostitis → decalcification

Treatment : (A) **Palliative :**
- (*a*) **Elastic bandage**
- (*b*) Postural treatment
  Ind : Pregnancy and mild secondary varices

(B) **Injections :**
Pre-investigations : primary or secondary

Indications :
- (*a*) Much disability
- (*b*) Complications : impending or actual
- (*c*) Public service entrance

Contraind :
- (1) Phlegmasia alba dolens with thrombosis or incompetency of deep veins
- (2) Phlebitis
- (3) Septic skin : eczema
- (4) Advanced cardiac, renal, pulmonary disease
- (5) Diabetes
- (6) Cirrhosis liver
- (7) **Pregnancy :** because
  - (*a*) varices may be temporary
  - (*b*) superficial veins needed for future white leg
  - (*c*) abortion if quinine used
- (8) Advanced arteriosclerosis

Solutions :

(1) **Quinine-urethane of Genevrier :**

Comp : Quinine Hydrochlor 4 gms.
Urethane 2 gms.
Distilled water 30 c.cs.

Dose : 3 c.cs. (½–1 c.c. at each site)

(B) **Leak ulcer :**
Etio : Leak from puncture
Clinic : Small superficial ulcer
Treat : Elastoplast strapping
(2) **Cellulitis and abscess**
(3) **Persistent œdema of the leg :**
Cause : Associated deep vein thrombosis
(4) **Recurrences :**
(5) **Pulmonary embolism :**
Rare . (*a*) Aseptic sticky thrombus
(*b*) *Reversal of current*
(6) **Bacteræmia :** ← embolism ← phlebitis

(C) **Operations :**

Ind . (1) Much disability
(2) *Complications : impending or actual*
(3) Public services entrance
(A) **Trendelenburg :**
: **Excision of one inch of the highest part *of saphenous vein*** *at the saphenous* opening, at its entrance into the femoral vein and above its highest tributary
Ind . (*a*) **Trendelenburg test positive**
(*b*) Thrill in the veins on coughing
(B) **Excision :**
(1) Local varices
(2) Babcock's subcutaneous excision of long portions

(D) **Combined operation + injection method :**

Ind : Trendelenburg test positive

Tech : Ligature + aspiration + injection
(1) Elevation of limb : empty the saphenous vein
(2) Ligature the proximal end at highest level
(3) Pass the ligature distal to it
(4) Pass the needle in distal end
(5) Aspirate
(6) *Injection of 4–5 c.cs. of 5% sod. morrhuate*
(7) *Tie the distal ligature*
(8) Divide the vein between two ligatures

After-treat : Rest in bed for two days

Advantage : *Only one sitting*

VARICOSE ULCER : (See gravitational ulcer under skin)

Clinic : (1) **Local :** Single, callous, indolent, irregular ulcer on the inner and lower part of the leg
(2) **Regional :** Cyanosis, œdema, pigmentation, eczema and varicosities

Treat : (1) **Rest :** Elevation, elastic bandages

(2) **Unna's paste:** Zinc oxide 3 Parts
Gelatine 3 „
Glycerine 5 „
Aqua 9 „

(3) **Elastoplast:** Zinc oxide paste elastic bandage

+ (4) **Injection treatment of varicose veins**

Compl: (1) Sepsis: dermatitis, cellulitis, periostitis, osteomyelitis
(2) Hæmorrhage
(3) Œdema

IX. NEW GROWTHS OF THE BLOOD VESSELS

(1) HÆMANGIOMA: (See under the skin)

(A) **Capillary:** Mother's mark; spider nævus; port-wine stain
(B) **Compact**
(C) **Cavernous**
(D) **Cirsoid:** Racemose or plexiform

(2) BLOOD-VESSEL SHEATH TUMOURS:

Malignant angio-endothelioma

Etio: Adults between 40 and 60

Path: Angio-endotheliomatous malignant tumour arising from blood-vessel sheath

Clinic: (1) Deep, circumscribed, bossy, firm, slow tumour in the course of a large artery
(2) Arterial aneurysm-like tumour with no bruit and not affected by proximal pressure

Compl: (1) Recurrence
(2) Metastases

Treat: Early and high amputation

X. OPERATIONS ON ARTERIES

(1) ARTERIAL SUTURE:

Essentials: (*a*) Perfect asepsis
(*b*) Intimal apposition
(*c*) Least injury
(*d*) No foreign material exposure to lumen
(*e*) Citrate solution
(*f*) No tension on sutures

Steps: (1) Exposure
(2) Temporary occlusion: proximal and distal clamps
(3) Suture:
Methods: (*a*) Lateral
(*b*) End-to-end
Material: 0000 chinese silk sterilized in liquid vaseline

Tech: (*a*) Three stay sutures
(*b*) Continuous sutures
(*c*) Interrupted mattress sutures
(4) Removal of distal → proximal clamps
(5) Closure

(2) ARTIFICIAL CANALIZATION OF ARTERY: Tuffier's method.

Ind: Temporary measure till the establishment of collateral circulation where primary ligature of a main artery may lead to gangrene.

Tech: (1) Preliminary temporary occlusion by Crile's clamp
(2) Excision of damaged portion of the artery
(3) Introduction and tying in of paraffined silver cannula
(4) Removal and double ligature after 4 days

After-treat: Elevation and protection of the whole limb

(3) LIGATURE OF ARTERIES:

Ind: (1) Amputations
(2) Hæmorrhage
(3) Aneurysm
(4) Pre-operative
(5) Malignancy
(6) Toxic goitre
(7) Arteriectomy

Tech (1) Incision adequate exposure
(2) Ligature:
Material (*a*) Non-absorbable. Silk
(*α*) Fascia lata
(*β*) Chronic catgut
(*b*) Delayed absorb

(*a*) Tie so as to damage the intima but not the media
(*b*) Ligature as near the place of pathology as possible
(*c*) Good isolation before passing the ligature
(*d*) Pass the ligature away from the neighbouring important structure
(*e*) Temporary proximal occlusion of the artery while ligature is tightened
(*f*) Ligature both ends in hæmorrhage
(*g*) Arteriectomy is better than ligature in continuity
(*h*) Ligature of the companion vein should accompany ligature of the main artery

Ligature of special vessels:

(1) Innominate:
. Removal of sternum

(2) Subclavian:
Incision. (1) Along the clavicle
(2) T-shaped with division of clavicle
Compl: Gangrene arm

(3) *Common carotid:*
Incision: Along ant. border of sternomastoid with cricoid as midpoint

Tech: Fascial strip suture
Compl: Cerebral

(4) External Carotid }
(5) Internal Carotid }

Incision: Along ant. border of sternomastoid from cricoid to mastoid

(6) Lingual:

Incision: (1) Along ant. border of sternomastoid (as for 4)
(2) Along the upper cornu of hyoid

(7) Superior Thyroid: (as for 6)

(8) Axillary:

Inc: (1) T-shaped with division of clavicle
(2) Below and along the middle half of the clavicle

(9) Brachial:

Inc: (1) Along the line of the artery
(2) Mid-clavicle to antecubital fossa

(10) Brachial bifurcation and its branches:

Inc: (1) Along the inner side of biceps tendon
(2) Along the lines of the branches
(a) Radial: between brachioradialis and flexor carp. rad.
(b) Ulnar: along radial margin of flex. carp. uln.

(11) Common Iliac } Transperitoneal route
Internal Iliac }

Incision: Median: umbilicus to pubes

(12) External Iliac: Extraperitoneal route

Inc: $\frac{1}{2}$ inch above and parallel to outer $\frac{2}{3}$rds of Poupart

(13) Femoral

(A) Common Femoral: Do not ligature
(B) Superficial Femoral
(a) Scarpa
(b) Hunter

Incision: Along the line of artery
(mid point of symphysis pubis and ant. sup. spine to adductor tubercle)

(14) Popliteal:

(A) Upper Popliteal
Inc: Adductor tubercle → along the arterial line on the inner side
(B) Lower Popliteal and Bifurcation:
Inc: 4 inches vertical between two heads of gastrocnemius

(15) Posterior Tibial:

Inc: (1) 1 inch behind and parallel to inner tibial border
(2) Between heads of gastrocnemius
↓ medial side of tendo achillis

(16) Anterior Tibial:

Inc: Mid tibiofibula to mid-malleoli: anterior

(17) Gluteal and Sciatic:

Inc: Semilunar: iliac crest → great trochanter → iliac crest

(4) EMBOLECTOMY:

Anæsth: Local

Points: (a) Rinse the gloves, instruments and sutures in 2 % citrate solution

(b) Vaselinize the curettes and probes

(c) Localize the embolus.

(1) Site of pain

(2) 4"—8" above the upper level of ischæmia

(3) Pulse obliteration

(4) Arteriography

(5) Exploration · at likely places

Tech. (1) Incision

(2) Exposure of main vessel and its branches

(3) Clamp proximal to the clot

(4) Distal arteriotomy

(5) Expression of the embolus and thrombus

(6) Suture of the artery by vaselinized fine silk

If embolus is not found:

(a) Dissect out the proximal part of the artery

(b) Open the artery and introduce catheter, curette or forceps

(5) ANEURYSM:

Pre-operative treatment

Non-surgical or non-mechanical intermittent compression of the parent artery

Endo-aneurysmorrhaphy ·

(A) Obliterative

Advant. (a) Least interference with collaterals

(b) Least interference with surroundings

Steps (1) Temporary digital arrest of circulation

(2) Incision and clearing of the sac.

(3) Suture of the orifices

(4) Obliteration of the whole sac.

(B) Restorative

Ind: Saccular aneurysm with small communication between the sac and vessel

Steps: (1), (2) } As in (A) above

(3) Suture the communication and other orifices

(4) Obliteration of the whole sac, leaving the artery intact

(C) Reconstructive:

Ind Fusiform aneurysm with healthy walls

Proximal and distal outlets near to each other

Steps: (1), (2) } As in (A) above

(3) Reconstruction of lumen over a catheter passed in the parent vessel

(4) As in (B) above

(6) PERIARTERIAL SYMPATHECTOMY

(A) Adventitiectomy:

Ind: Temporary improvement of peripheral circulation in:

(*a*) Chronic ulcerative lesions

(*b*) Dry gangrene

(*c*) Preliminary to amputations

Steps: (1) Exposure

(2) Isolation

(3) Sub-adventitious injection of saline

(4) Clipping away 1½" of adventitia all round

(B) Alcohol Injection

Steps: (1) (2) } As in (A) above

(3) Injection of 12-20 minims of alcohol into adventitia for one inch all round

(C) Arteriectomy.

Steps: (1) (2) } As in (A) above

(3) Double ligature at upper extremity

(4) Double ligature at lower extremity

(5) Excise 1"—1½" of the intervening portion

(D) Accessory operation:

Ligature of companion vein

(7) BLOOD TRANSFUSION:

Ind: (1) Hæmorrhage: (A) Severe primary:

(α) Traumatic

(β) Pathological: (jaundice)

(B) Secondary

(2) Hæmolysis: Anæmias:

(3) Toxic states: (*a*) Toxæmias

(*b*) Uræmia

(*c*) Diabetic coma

(*d*) Burns

(*e*) Convulsions

(4) Infections: Immuno-transfusion

(5) Defective coagulation:

(*a*) Jaundice

(*b*) Hæmophilia

(*c*) Purpura

(6) Restorative: Pre and post-operative

Time: (1) Prophylactic: pre-operative

(2) Therapeutic

Varieties: (1) Homo-transfusion:

(*a*) Another donor

(*b*) Cadaver

(*c*) Placental

(*d*) Preserved

(2) Auto-transfusion
: Collection of blood, bled from patients' own body and its reintroduction after filtering as in:
(a) Hæmothorax
(b) Hæmoperitoneum

N.B.—There should not be any injury to the Internal hollow viscera or any contamination.

Investigations:

(1) Blood matching
(A) Group tests. Group I: universal recipient
Group II. recipient of II and IV
Group III. recipient of III and IV
Group IV universal donor
Every group being recipient and donor of its own group
(B) Individual tests
(1) Cells of donor + serum of recipient
. Serum of the recipient should not agglutinate the corpuscles of donor (and vice versa)
(2) Blood drop of donor + Blood drop of recipient
No clumping
(Only in urgent cases)
(C) Cross grouping (cross-agglutination) test
(1) Serum of recipient against donor's cells
(2) Serum of the donor against recipient's cells
(1) Plasma { (a) Mix 6 drops of blood from the finger with one drop of 5 % sod citrate; (b) Centrifuge; (c) Pepette off the supernatant plasma }
(2) Cell Mix one drop of packed cells with 2-3 c cs. of saline
(3) Do the slide test
. Plasma (1c) + cell suspension (2)
Watch for agglutination

(2) Investigations of both
(a) Blood pressure
(b) Heart condition
(c) Blood condition
(d) Renal condition

(3) Investigations of donor only
(a) Metabolic diseases
(b) Specific communicable diseases. syphilis, malaria

Methods.
(1) Direct method:
(2) Indirect method
(A) Whole blood without admixture of anticoagulant
(a) Lindeman's syringe method
(b) Kimpton Brown paraffined flask

(B) Citrated blood

(a) Storage method

: Stored in citrate sol. and infused afterwards

(b) Simultaneous method: Three way syringe:

(α) to donor

(β) to citrate sol.

(γ) to recipient

(3) *Dry method*

Preserved r.b cs and dried bloodplasma

A known amount of saline is added to these before transfusion

Blood storage methods:

(1) Living donor: citrated blood

(2) Cadaver: 900–3500 c.cs. from internal jugular vein within 6 hours of death from asphyxia without any infection in body

(3) Foetal:

(a) Blood collected from the severed placental end of umbilical cord, citrated and preserved

(b) Shaken—warmed—filtered

↓ transfusion if suitable

(eclampsia is no bar)

(4) Dry method

(a) preserved blood cells

(b) preserved blood plasma—powder

Anticoagulants:

(A) Citrate method:

: 3.8% isotonic sodium citrate sol.

one part of citrate to 9 parts of blood

(B) Heparin method·

: Intravenous heparin to donor ½ hour previous, dose being 1 mgm. per kiloweight. Blood remains fluid for 30 to 40 minutes

(C) I. H. T. Solution (Moscow)

Composition:		
Sodium chloride	7.0	grms.
Sodium citrate	5.0	„
Potassium chloride	0.02	„
Magnesium sulphate	0.004	„
Distilled water	1000.	c.c.

mixed with equal parts of blood

Temperature for preservation of blood: 2° to 4° C.

Sites: (1) Elbow veins

(2) Internal saphenous near the ankle

(3) Superior longitudinal sinus (infants)

Quantity:

(1) Hæmorrhage:

: 300—700 c.cs.

nearly as much as lost

(2) Anæmias—toxæmias
: 75—150 c.cs. repeated
(3) Infants: 10 c.cs. per pound body weight

Compl: (1) Rigors
(2) Temperature
(3) Cardiac embarassment
(4) Hæmolysis: (1) Jaundice
(2) Uræmia
(5) Anaphylactic Shock: urticaria
(6) Urinary suppression

IMPORTANT POINTS

(1) Hæmorrhage:

(*a*) Never give intravenous saline in cases of hæmorrhage till its source is under complete control.

(*b*) *Beware of internal hæmorrhage in* operations on internal viscera. Always adopt a position which facilitates the appearance of bleeding externally in these cases whenever possible, viz., raise the head in rectal or uterine operations.

(*c*) Never start an operation, in which some bleeding is expected, without ascertaining the coagulation and bleeding time.

(*d*) Beware of a bandage where hæmatoma is expected; the pressure symptoms may develop afterwards as the hæmatoma progresses.

(*e*) Never forget to see the colour of conjunctivæ, mucous membranes and nails in every acute surgical condition, traumatic or non-traumatic.

(*f*) Beware of reactionary hæmorrhage in amputations and after operations done in shock. Beware of secondary hæmorrhage in all septic conditions.

(*g*) A streak of blood on 5th or 6th day after an operation for septic or malignant condition may be a death warrant An acute flood of secondary bleeding may start at any moment without any further notice.

(*h*) Beware of too tight and too long application of a tourniquet, which may lead to paralysis.

(*i*) Morphia is one of the best treatments for shock accompanying the hæmorrhage and also helps to lessen it by quietening the patient.

(2) Aneurysm:

(*a*) A pulsating cystic swelling in the course of a main artery is an aneurysm, unless proved otherwise.

(*b*) Main conditions to be differentially diagnosed are:

(α) Swellings adherent to a blood vessel
(β) Vascular tumours

(c) Most common predisposing cause of a spontaneous aneurysm is syphilis.

(d) Under no circumstances an undiagnosed gluteal swelling should be aspirated.

(e) The treatment of an aneurysm
: (α) Clotting or excision
(β) Relief of pressure

(f) Cause of failure after ligature operations for aneurysm
: Revascularization by collaterals.

(g) Complication of ligature operation for aneurysm
: Post-operative gangrene

(h) Aneurysm of common carotid presents in the neck
Aneurysm of internal carotid rarely presents in the neck

(i) ? Sunstroke in young patients (violent headache → rapid unconsciousness): Do the lumbar puncture. If C.S.F. is bloody, it is a case of spontaneous rupture of congenital intracranial aneurysm.

Small aneurysm is the commonest cause of isolated third nerve palsy.

(j) Ideal treatment of arteriovenous aneurysm:
Quadruple ligature + excision of the aneurysm:

Except in cavernous-carotid aneurysm where proximal ligature is done.

(k) Aneurysmal varix is stationary; varicose aneurysm is progressive.

(l) In every case of varicose veins, look for arteriovenous aneurysm.

(m) In every case of arteriovenous aneurysm, examine the heart.

(n) Final test of arteriovenous aneurysm is to estimate the oxygen content of the blood from deep veins of the extremity as compared with the blood from other veins.

(o) Ideal operation for an aneurysm is endo-aneurysmorrhaphy by intrasaccular method; though proximal ligature or excision with double ligature are the most practicable methods.

(p) Always test the collateral circulation of a limb before tackling an aneurysm surgically.

(q) Preliminary intermittent temporary [illegible]

(r) Hunter's operation for an aneurysm predisposes to gangrene.

(3) Arterial Thrombosis and Embolism:

(*a*) Arterial thrombosis and embolism is an important factor in the ætiology of gangrene, especially if collateral circulation is abnormal.

(*b*) Embolus is more likely to produce gangrene than ligature of main artery, as the secondary thrombosis from it spreads peripherally down the artery and its branches.

(*c*) Every embolus which causes circulatory disturbance of a *threatening* character in either extremity, should be removed by arteriotomy as soon as possible.

(*d*) Arterial embolism syndrome:
- (α) Heart lesion or blood-vessel disease
- (β) Sudden pain along an artery
- (γ) Circulatory failure in peripheral part

(*e*) Except the popliteal, occlusion of larger arteries by *thrombosis is not marked by sudden pain, as in* embolism

(*f*) Earlier the operation of embolectomy, better the outlook. Embolectomy is unnecessary after 12 hours and below the bifurcation of brachial and popliteal arteries.

(*g*) Sudden acute pain in a limb or abdomen in a vascular or cardiac patient: ? embolism

(*h*) A good *arteriectomy* is better than a bad embolectomy, and has the added advantage of periarterial sympathectomy; the ligature of main vein adds further to the safety of the limb.

(*i*) Most common sites for emboli
- (α) Femoral artery at the adductor hiatus
- (β) Femoral artery at the branching of profunda

(4) Thrombo-phlebitis and venous thrombosis:

(*a*) All forms of thrombo-phlebitis start as an inflammatory lesion of the vein wall, leading to thrombosis

(*b*) More than 80% of cases of post-operative thrombosis follow operations on the abdomen especially:
- (α) Appendix
- (β) Gall bladder
- (γ) Pelvic organs

(*c*) Four main causes of thrombosis of veins:
- (α) Sepsis
- (β) Trauma
- (γ) Stasis
- (δ) Altered blood

(*d*) Most common clinical states of which vein thrombosis is a complication:
- (1) Post-operative
- (2) Post-convalescent

(3) Local sepsis
(4) Septic abortion
(5) Varicose veins

(e) Phlebitis of a surgically accessible and recognizable vein is the feeding focus of surgical septicæmia, which can be prevented by proximal ligature

(f) Superficial phlebitis is a safe lesion in an ambulent patient but becomes dangerous when patient stays in bed

(5) **Vasospastic diseases of the arteries:**

(a) Three common diseases of peripheral arteries:
  (1) Degenerative: arteriosclerosis, atheroma
  (2) Thrombo-angiitis: Buerger's disease
  (3) Vasospastic:
    (a) Primary:
      (1) Raynaud
      (2) Acryocyanosis
      (3) Erythrocyanosis
      (4) Hyperhydrosis
      (5) Erythromelalgia
    (b) Secondary:
      (1) Infantile paralysis
      (2) Cervical rib
      (3) Peripheral embolism
      (4) Rheumatoid arthritis

(b) Vasospasm and vasodilatation is due to supply of vaso-constrictor and vasodilator hormones brought via stimuli:
  (A) General: blood: adrenaline; histamine
  (B) Local: (a) Vaso-constrictor or dilator sympathetic
             (b) Reaction of arteriolar muscle

  General vascular tone depends on the balanced activity of these factors

(c) Results of sympathetic ganglionectomy
  (α) Raynaud · good
      lumbar better than stellate
  (β) Thrombo-angiitis: 50%
  (γ) Arteriosclerosis: relief only in early stages

(d) Only indications for sympathectomy in arterial disease:
  (α) Proved cases of uncomplicated and progressive vasospasm
  (β) Temporary improvement in peripheral circulation:
    (1) Preliminary to amputation
    (2) Aid to healing of circulatory or nervous ulcers

(e) Peripheral vaso-constrictors run along the somat nerves and not along main vessels.

(*f*) Sympathetic ganglionectomy destroys the power of peripheral arterioles to dilate as well as to constrict.

This loss of vasodilatation *reaction constitutes the* chief drawback to sympathetic operations.

(*g*) Lumbar ganglionectomy gives far superior results than cervicodorsal does because *in the former the* preganglionic fibres are severed.

(6) **Thrombo-angiitis obliterans :**

(*a*) Raynaud affects hands of young women
Buerger affects feet of middle aged men

(*b*) Thrombo-angiitis obliterans or Buerger is a presenile, non-syphilitic, thrombo-obliteration of the deep vessels of the lower extremities of males with :

- (α) Postural colour changes
- (β) Obliteration of pulse
- (γ) Migrating phlebitis

(7) Diagnosis of circulatory disturbances of extremities :

- (*a*) Peripheral pulse
- (*b*) Surface temperature at various levels
- (*c*) Postural colour changes
- (*d*) Histamine reflex
- (*e*) Pachon's oscillometer
- (*f*) X-Rays. simple, arteriography
- (*g*) Warm bath 43°–45°C. for 35 minutes for forearm
  ↓
  rise in toe temperature
- (*h*) Intravenous typhoid vaccine
- (*i*) Spinal anæsthesia
- (*j*) Posterior tibial anæsthesia (or Ulnar)
- (*k*) Reactive hyperæmia test

(8) Intermittent venous occlusion by a pneumatic cuff may be tried in peripheral arterial diseases :

- (*a*) Thrombo-angiitis obliterans
- (*b*) Arteriosclerosis : diabetic and non-diabetic
- (*c*) Gangrene

(8a) In arteriosclerosis and *endarteritis, collateral circulation is* more affected than in thrombo-angiitis, diabetic arteritis and embolism and so gangrene is more common and surer and is the result of thrombosis or infection

Angle of circulatory efficiency is an index of the degree of arterial occlusion in circulatory disease.

(9) Intermittent claudication is a *symptom of muscular ischæmia* and is due to :

- (*a*) Arteriosclerosis
- (*b*) Thrombo-angiitis obliterans

It affects legs, arms and tongue
Sympathectomy is the best treatment of intermittent claudication.

(10) **Arteritis** includes:

(*a*) Etio: (1) Acute infective arteritis
(2) Chronic infective arteritis
(3) Syphilitic arteritis
(4) Atheroma and arteriosclerosis
(5) Diabetic arteritis

(*b*) Age types: (1) Juvenile: under 40
(2) Presenile: 40-50
(3) Senile: over 50

(11) In gangrene of a-limb, vasodilator response test will show whether the lesion is spastic or sclerotic
Simple vasodilator test is spinal anæsthesia;
Positive test: (*a*) Thrombo-angiitis: early cases
(*b*) Raynaud
Negative test: Arteriosclerosis

(12) In every case of arterial obstruction, find out.

(α) Sclerotic factor: (*a*) Arteriosclerosis
(*b*) Thrombo-angiitis obliterans

(β) Spastic factor: (*a*) Raynaud
(*b*) Erythromelalgia

(13) If after warming the forearm in water at a temperature of from 43°–45°C for 35 minutes, the surface temperature of the toe rises above 31·5°C., obliterative structural disease of the arteries of the lower extremities is absent.

(14) (*a*) Election of site for amputation in vascular gangrene:
(1) Pulse level
(2) Postural tests: colour, heat, sensations, pulse
(3) Vasodilator response tests
(4) *Well above the infection*
(5) Arteriography
(6) Peripheral puncture or incision with main artery compressed: ? level of bleeding

(*b*) The site can be more distal if preliminary peri-arterial sympathectomy is done one week before amputation.

(*c*) Common sites of amputation in vascular gangrene of lower extremity:
(α) Toes
(β) Midleg: 6 inches below tibial tubercle
(γ) Lower thigh: 3 inches above the knee

(15) **Varicose veins:**

(*a*) In every case of varicose veins, find out whether primar or secondary

(4) Varicose veins
(5) Gradual arterial obliteration with inadequate collateral circulation

(c) Sites for femoral vein ligature
(1) Scarpa: below great saphenous entry
(2) Hunter: in association with periarterial sympathectomy
(3) Popliteal: below small saphenous entry

(d) A proximal ligature should never be applied to a main trunk artery especially at a distance from the wound or aneurysm.

(e) Arteriectomy is better than simple ligature

(f) Inferior vena cava may be ligated below the level of the renal veins.

(g) Practically any of the main limb vessels may be ligatured in continuity without risk of gangrene, especially if the companion vein is also tied, except in:
(a) Severe lacerated injury
(b) Occlusion of collaterals
(c) Aneurysm

(h) Simultaneous ligation of companion vein in ligation of main artery.
Ind: Inadequate collateral circulation
Contraind: Adequate collateral circulation

(i) Bleeding after puncture or incision of any position of peripheral arterial tree when the main trunk is compressed, is a sign of adequate circulation.

(j) It is better to tie individual branches of popliteal than popliteal itself, to avoid gangrene.

(k) There is less danger of gangrene resulting from ligation of main artery in the upper limb, than in the lower.

(l) For ligation of a vein, silk is better than catgut

(m) After ligature of an important vessel, a careful watch must be kept on the circulation of tissues it supplies and bear in mind its possible complications:
(1) Ischæmic myositis
(2) Gangrene
(3) Secondary hæmorrhage

(n) Ligature of iliac or common femoral, Ligature of sub-clavian, Ligature of common carotid } lead to complications

(17) In arterial suture:

(a) No part of media or adventitia should come in contact with blood

(b) Distal clamp must be released first

(c) Watch for leakage after release of the proximal clamp

(18) **Heparin treatment:** 10 units of heparin to 1 c.c. of saline intravenously

Ind: (1) Post-operative active thrombosis
(2) Phlebitis
(3) Embolism
(4) Operations on blood vessels
(5) Blood transfusion
(6) Coronary and cardio-vascular thrombosis

(19) (*a*) Chief indications for **blood transfusion:**
(1) Hæmorrhage
(2) Hæmolysis
(3) Defective coagulation
(4) Toxic blood
(5) Immuno-transfusion

(*b*) Citrate method is the best
(α) Direct: three-way syringe
(β) Indirect: storage method

(*c*) Half an hour should be the least time for transfusion of 500–600 c.cs.

(*d*) In every case direct cross agglutination tests between donor's blood and recipient's blood should be carried out.

(*e*) In multiple transfusions, every time, do:—
(*a*) Cross agglutination test
(*b*) Anaphylaxis test

(*f*) Three stages of blood transfusion
(α) Testing the blood
(β) Collecting and citrating
(γ) Infusing

(20) Places for **infusion** in infants.—
(α) Internal saphenous just anterior to internal malleolus
(β) *Superior longitudinal sinus at the anterior fontanelle*

CHAPTER VI

THE LYMPHATICS AND LYMPH GLANDS

I. TRAUMA

TRAUMA TO THE THORACIC DUCT

(A) IN THE NECK

Etio. (1) *Operations on the root of the neck*
- (*a*) Excision of inferior cervical glands
- (*b*) Thyroidectomy
- (*c*) Thymic tumours
- (*d*) Cystic hygroma
- (*e*) Phrenicectomy

(2) Gunshot wounds, stabs
(3) Fracture sternum or clavicle

Clinic: (1) *Chylorrhea, chylocyst or chylous fistula*
(2) Chyle inanition

Diag. *Serous exudate turning milky on taking fats*

Treat. (A) Immediate: In operative or accidental trauma
- (1) *Identification and ligature*
- (2) Identification and anastomosis

(B) Post-operative cases
- (1) Glycerine pack + pressure bandage
- (2) Ingestion of large quantities of cream
  - ↓ Reopening of the wound
  - ↓ Identification and ligature
  - ↓ *Drainage*

(B) IN THE THORAX: TRAUMATIC CHYLOTHORAX.

Etio: (1) External violence
- (*a*) Closed trauma
- (*b*) *Fracture thoracic wall*

(2) *Wounds.*
- (*a*) Operative
- (*b*) Stab
- (*c*) Gunshot

Clinic (*a*) Symptoms:
- (1) History of injury with shock
- ↓ (2) Latent period
- ↓ (3) Crisis period:
  - (α) Shock
  - (β) Dyspnœa with cyanosis
  - (γ) *Semi-consciousness*
  - (δ) Acetonuria

(b) Physical signs:
(α) Of fluid in the thorax
(β) Pressure signs
(c) Asthenia and inanition

Diagnosis: Aspiration

Diff. diag: (1) Hydrothorax
(2) Hæmothorax
(3) Pyothorax empyema
(4) Pneumothorax

Complications: (A) Immediate
(a) Collapse of the lung
(b) Heart failure
(B) Remote. inanition

Treat: (A) (1) Treatment of Shock and injuries
↓ (2) Repeated pleural aspirations
↓ (3) Intravenous aspirated chyle
↓ (4) Carbohydrate fluid feeds
(B) Thoracotomy and drainage

(C) IN THE ABDOMEN: CHYLOUS ASCITES:

Etio (1) Stab wound of the upper abdomen
(2) Hard blow on the epigastrium

Clinic (1) History or signs of trauma
(2) Signs of ascites. free fluid in peritoneum
(3) Milky fluid on tapping
(4) Dehydration, inanition and asthenia

Treat (1) Repeated tappings
(2) Saphenous vein—peritoneal anastomosis

II. INFLAMMATION OF THE LYMPH VESSELS

(1) ACUTE LYMPHANGITIS:

Etio. (1) **Infected trivial wounds**
(2) Small septic foci
(3) Filariasis

Pre-disp: (1) Metabolic disease: **diabetes,** nephritis
(2) Lack of resistance to streptococci

Exciting: Infection by **streptococcus**

Special sites: (1) Palm: needle pricks of surgeons
(2) Soles: thorn or nail pricks
(3) Elephantiasis

Clinic: (1) Cutaneous and subcutaneous **red streaks** from a trivial septic focus to the regional lymph glands.
(2) Lymphatic œdema
(3) Tenderness of **regional lymph glands**
(4) General marked toxæmia or **septicæmia**

Compl : (1) **Acute Lymphadenitis**
(2) Abscesses along the lymphatics
(3) **Cellulitis** → gangrene
(4) Bursitis with suppuration
(5) **Septicæmia**

Treat : (1) **Local antiseptic treatment of primary focus**
(a) Excision in toto
(b) Cauterization
(c) Dressings :
Phenol 1%
Salicylic acid 2%
Camphor 3%
Lanoline to 3%
(d) Hot baths and Bier's congestion
(e) Rest in splint or plaster bed

(2) **General :**
(a) **Sulphonamide** group
(b) **Antiserum :** 50 → 30 → 20 → 10 c.cs.
(c) Iron and vitamins

(2) CHRONIC LYMPHANGITIS :

Etio : **Recurrent streptococcal infections**
(a) **Erysipelas :** Chronic and recurrent
(b) **Filariasis**
(c) Primary chancre
(d) T.B., associated with T.B ulcers

Clinic. (1) Chronic lymphatic œdema with recurrent attacks of inflammation
(2) Hypertrophy of skin and subcutaneous tissues

Compl : ***Elephantiasis***

III. NEW GROWTHS OF THE LYMPH VESSELS

LYMPHANGIOMA :

(A) CAPILLARY OR NAEVOID LYMPHANGIOMA :

Varieties : (a) Localized
(b) *Diffuse, macrochelia, macroglossia*

Treat. (a) Radium
(b) Deep X-Ray
(c) Electrolysis
(d) Surgical excision

(B) CAVERNOUS LYMPHANGIOMA :

Clinic : **Soft, compressible, sponge-like**
Resembles cavernous nævi except bruit and pulsations
Bluish discolouration

(C) CYSTIC LYMPHANGIOMA: CYSTIC HYGROMA:

Etio: Children

Origin: Vestigial rests from jugular sacs

Sites: **Neck, axilla,** pectorals, groin, sacral, retroperitoneal

Path: Conglomeration of endothelial cysts with serous fluid

Clinic: (A) **Multilocular:**
- Bluish, transparent, thin walled, multilocular cyst with clear serous fluid in the lower part of the neck under the sternomastoid

(B) **Unilocular:**
- Solitary lymph cyst
- Smooth, fluctuating, globular swelling in the neck

Diff. diag: of cystic hygroma in the neck
1. Caseating tuberculous gland
2. Branchial cyst
3. Encysted lipoma
4. Aneurysm

Compl: (1) Recurrent streptococcal inflammation
(2) Lymphorrhea
(3) Adhesions to surrounding parts

Treat (A) **Multilocular:**
- (a) Injections of sod. morrhuate
- (b) Deep X-Rays
- (c) Radium

(B) **Unilocular:**
- (a) Aspiration
  ↓ Injection of quinine urethane 3-5 c.cs.
- (b) Excision

IV. LYMPHATIC OBSTRUCTION

Etio: (1) **Congenital:** Lymphangiectasis
(2) **Post-operative:** Removal of a group of glands
(3) **Traumatic:** Obliteration of lymphatics by a scar
(4) **Inflammatory:** Obliterative lymphangitis
- (a) **Filariasis**
- (b) **Puerperal** white leg
- (c) Facial erysipelas
- (d) Lupus

(5) **Neoplastic:** Carcinomatous permeation
- (a) Brawny arm
- (b) Peau d'orange

(6) **Parasitic:** Filariasis

Clinic: (1) **Lymphatic œdema:** Pitting on pressure
↓ (2) Brawny solid œdema
↓ (3) Hypertrophy of the skin and subcut. tissues **(elephantiasis)**
↓ (4) **Lymphorrhea**

Compl: (1) Heaviness
(2) **Recurrent streptococcal inflammations**
(3) Malnutrition of skin: ulcers, eczema
(4) Nerve and muscle paralysis

Treat: (1) **Conservative:**
(*a*) **Postural**
(*b*) Physiotherapy
(*c*) **Antistrepto. serum**
(*d*) Sulphonamide group

(2) **Operative:**
(*a*) **Handley's** lymphangioplasty
(*b*) **Kondoleon's** excision of wedgeshaped strips of skin, subcutaneous tissues and deep fascia
(*c*) Excision of all affected tissues (scrotum and penis)
(*d*) Amputation

V. ACUTE LYMPHADENITIS

Etio (1) **Acute septic** focus in the catchment area
(2) Secondary to chronic Lymphadenitis T B.
(3) **Bubonic Plague**
(4) Glandular fever: infective mononucleosis

Clinic. (1) Soreness and stiffness in the region
↓ (2) Acutely tender, rapid, firm, discrete enlargement
↓ (3) Periadenitis: fixation to one another
↓ (4) Cellulitis
↓ (5) Abscess formation
↓ (6) Bursting
↓ (7) Sinus formation

Compl: (A) **Local:**
(*a*) **Abscess**
(*b*) Secondary hæmorrhage

(B) **General:**
(*a*) Toxæmia
(*b*) Pyæmia
(*c*) Septicæmia

Sequelæ:
(*a*) **Chronic lymphadenitis**
(*b*) T.B. lymphadenitis

(A) **Conservative :**

Treat : (1) **Treatment of local focus**
(2) **Local :** Rest and counter-irritation to the glands
(3) **General :** Sulphonamide group
Specific antiserum

(B) **Operative :** *Incision and drainage with hypertonic dressings*

Post. compl : (1) Chronic lymphadenitis
(2) Ulceration unhealing incision
(3) Lymphatic œdema in catchment area

Special groups :

(1) DEEP CERVICALS :

Etio : **Septic focus : Face, oral cavity, pharynx**

Sp Compl (*a*) **Cervical cellulitis**
(*b*) **Œdema glottis**
(*c*) Mediastinal abscess
(*d*) Internal jugular vein thrombosis
(*e*) Ulceration into internal carotid

Treat Drainage by Hilton's method

(2) SUBMAXILLARY GLANDS :

Etio ***Infected tooth, tongue, cheek***

Clinic : Inflammatory brawny swelling in the submaxillary area

Diff. diag. (1) **Ludwig's angina**
(2) Acute periostitis or **osteomyelitis jaw**

Compl : **Œdema of the glottis**

Treat : Incision and drainage by Hilton's method

(3) RETRO-PHARYNGEAL GLANDS :

Etio Pharyngeal sepsis

Clinic : **Acute retro-pharyngeal abscess :**
(*a*) Crowing respiration
(*b*) Attitude
(*c*) Bulging behind soft palate

Compl : (*a*) Asphyxia
(*b*) **Aspiration pneumonia**

Treat : (*a*) Rose's head-low position
↓ (*b*) *Drainage by Hilton's method into pharynx*

(4) AXILLARY GLANDS :

Etio. (1) **Sepsis from the hand :** Whitlow, Lymphangitis
(2) **Sepsis from the breast :** Acute mastitis

Clinic : Tender inflammatory mass in the axilla

Treat : (1) Conservative
(2) Operative :
(*a*) Incision : (α) along the floor of the axilla
(β) away from the lateral wall
(γ) parallel to important structures
(*b*) Hilton's method
(*c*) Sling to the arm

(5) INGUINAL GLANDS: Most common site

Etio : (*a*) **Venereal sepsis**
(*b*) Perineal sepsis
(*c*) Gluteal sepsis
(*d*) **Inferior extremity (foot) sepsis**

Clinic : (*a*) **Tender inflammatory mass**
(α) Supra-poupart : transverse
or (β) Infra-poupart : vertical
(*b*) **Fluctuating abscess : Bubo**

Treat : (*a*) Conservative
(*b*) Operative
Vertical incision and drainage

(6) POPLITEAL GLANDS:

Etio : Sepsis from
(1) the outer side and the sole of the foot
(2) lateral and posterior sides of the leg

Clinic Tender inflammatory popliteal swelling

Diff. diag : Inflamed or thrombosed popliteal aneurysm

Treat : (1) Conservative
(2) Operative : incision in front of biceps tendon

(7) ILIAC GLANDS:

Etio : **Sepsis from the foot** (especially in children)

Clinic (*a*) Deep tender mass ↓ Fluctuating swelling } in the iliac fossa
(*b*) Flexion of the hip : psoas contracture

Diff. diag : (*a*) **Acute appendicitis**
(*b*) Acute psoas abscess
(*c*) Parametritis

Treat : (*a*) Conservative
(*b*) **Operative :**
Incision above and parallel to outer half of the Poupart, just above the ant. sup. iliac spine & then parallel to iliac crest (Astley Cooper)

(8) ACUTE ABDOMINAL LYMPHADENITIS:

Etio : Children under 15

Path : Pyogenesis via
(*a*) Gut
(*b*) Blood

Clinic: (*a*) Acute pseudo-appendicitis
(*b*) Recurrent subacute abdomen with wasting
Diff. diag: Other causes of acute abdomen (inflammatory)
Compl: Bursting into general peritoneal cavity
Treat: (1) Exploratory laparotomy
↓ (2) Appendicectomy and peritoneal toilette
↓ (3) Biopsy of a gland

VI. CHRONIC LYMPHADENITIS

(A) SEPTIC CHRONIC LYMPHADENITIS:

Etio: (*a*) Chronic septic focus in the catchment area
(*b*) Incomplete resolution of acute lymphadenitis
Clinic: (1) Moderately enlarged, Slightly tender, Mobile and discrete } lymph glands
(2) **No periadenitis**
Diff. diag: From specific glandular enlargement
Compl: **Tuberculosis**
Treat: **Conservative:**
(*a*) Treatment of primary focus
(*b*) Counter-irritation
(*c*) *General: tonics*

(B) TUBERCULOUS LYMPHADENITIS:

Etio: Age: Children and adolescents
Incidence. **Mohammedan women**
Predisposer: Chronic septic focus in catchment area
↓ **Septic chronic lymphadenitis**
Path: Bacteriology: **Bovine** type
Routes: (*a*) Lymphatics: tabes mesenterica
apical glands
(*b*) Blood
Stages: (*a*) Tubercle formation
↓ (*b*) Fibrosis:
(1) glandular
or (2) periglandular
or (*c*) Caseation:
(1) Cold abscess
↓ (2) Sinus
Morb. anat: Degenerated tubercular bacilli
Endothelial and giant cells
Lymphocytes
Verieties: (1) **Caseous:** Collar-stud abscess
(2) **Lymphoid:** Pseudo-Hodgkin
(3) **Fibrous:** Hard matted glands

Clinic: **(A) TYPES:**

(1) **Localized:** Enlargement of local gland with primary focus in catchment area: (indistinguishable from chronic septic lymphadenitis)

(2) **Regional:** Enlargement of regional glands

(3) **Spreading:** Further stage to (2)

(4) **Diffuse:** Enlargement of more than one group not contiguous

(5) **Complicated:** Association with other T.B. foci
- (a) Phthisis
- (b) T.B. joints

(B) STAGES:

(1) **Latency:** Indolent, painless, slow, palpable (chronic septic lymphadenitis)

↓ (2) **Hyperplasia:** Periadenitis with matting

↓ (3) **Caseation:** Fluctuation. cold abscess

↓ (4) **Infection:**
- (a) Acute cellulitis
- ↓ (b) Acute abscess

↓ (5) **Sequelæ:**
- (a) Tuberculous sinus or ulcer
- (b) Fibrosis and calcification
- (c) General T.B. toxæmia

Special Signs (1) Blood.
- (a) Complete blood count
- (b) Wassermann or Kahn

(2) X-Rays lungs, bones, abdomen

(3) Microscope
- (a) Caseous discharge
- (b) Biopsy

(4) Specific:
- (a) Tuberculin
- (b) Guinea pig

Treat. (A) **Preventive:**

(1) Care of the milk
(2) Removal of septic foci
(3) Isolation from T.B.
(4) Periodic medical examinations
(5) Attention to general health

(B) **Curative :**

Indications : (1) **Age :**

(*a*) Children upto 2 : conservative
(*b*) Older children } radical
(*c*) Adults } radical
(*d*) Old : conservative

(2) **Economic condition :**

(*a*) Good : conservative → radical
(*b*) Bad . radical

(3) **Extent and type of the disease :**

(A) **Conservative :**

(α) Localized, early, reacting
(β) Generalized, complicated
(γ) Bad general health

(B) **Radical :**

(1) Local glandular mass :
(*a*) Not reacting to conservation
(*b*) Progressing to other groups
(*c*) Caseating
(*d*) With secondary infection
(*e*) Residual, after aspiration of cold abscesses
(*f*) Large & calcified
(2) Absence of generalized or complicating T. B.
(3) Good general health

Contraindications for radical treatment :

(1) Blood-borne widespread T. B
(2) Children below 2 and seniles
(3) Bad general health
(4) Very early stage
(5) Acute periadenitis : T. B. cellulitis
(6) Metabolic diseases ; pregnancy

(1) **Conservative treatment :**

(A) **Removal of septic catchment focus** : Tonsils and adenoids
(B) **Sanatorium** treatment
(C) **General** tonics : Cod-liver oil, vitamines, iron
(D) **Local adjuvents :**

(*a*) Fomentations :
(α) T. B. Periadenitis or cellulitis
(β) Secondary infection
(*b*) **Counter-irritants :** Early mild cases
(*c*) **Aspiration :** Cold abscess

(*d*) **Heliotherapy**: Sun bath ...
(*e*) Tuberculin
(*f*) Deep X-rays:
Contraind: (α) Calcification
(β) Caseation
(γ) Secondary infection
(*g*) **Ultra-violet**:
Ind: (α) Sinuses and ulcers
(β) Scattered, widespread enlargement of glands
(γ) Post-operative

(2) **Operative treatment**:

(A) **Aspiration**:
Ind: T.B. cold abscess

(B) **Incision and drainage**
Ind: T.B. abscess with secondary infection
After-treat. (*a*) Immobilization
(*b*) X-ray and ultra-violet
(*c*) Dissection of residual glands

(C) **Incision, evacuation and curettage**
Ind: Caseation with cold abscesses

(D) **Intracapsular enucleation**:
Ind. Multiple caseating foci

(E) **Radical Excision**:
Ind. (*a*) Failure of conservative operations
(*b*) One group affected
(*c*) No generalized or complicating focus
(*d*) General health good

(3) **Palliative treatment**:
Ind (*a*) Generalized T. B. glands
(*b*) Complicating T. B. focus
(*c*) Bad general health
(*d*) Progressive and late stage
(A) Ultra-violet exposures
(B) Deep X-Ray therapy
(C) Local minor surgical procedures: if required
(D) General conservative anti-tuberculous treatment

TUBERCULOSIS OF DIFFERENT LYMPH GLAND GROUPS:

(1) FACIAL GROUP: Posterior and anterior auricular
Etio: Septic ear, sepsis scalp

Oper. treat: (1) Incisions:
- (a) Post-auricular: transverse local
- (b) Ant.-auricular: parallel to facial branches

(2) Save: Facial branches
Stenson's duct

(2) CERVICAL GROUP:

Etio: (1) **Septic tonsils and adenoids:**
Upper anterior cervicals
(2) Septic scalp: posterior cervicals
(3) **Apex lung**
(4) **T. B. axillary glands** } inferior cervicals

Treat: Radical excision: when indicated
(1) Pre-operative: scalp exusion
(2) Anæsthesia: morphine—atropine
or omnopon—scopalamine
↓ general anæsthesia
(3) Position: sand-bag under the shoulder
face to the opposite side
(4) Technic:

(A) **Occipital:**
Incision. transverse over the anterior border of trapezius
Save: (a) Great occipital nerve
(b) Occipital artery

(B) **Superficial cervical:**
Incision: transverse crease

(C) **Submental:**
Incision. transverse midway between hyoid and mandible

(D) **Submaxillary:**
Incision. (a) *Symphysis → hyoid → 1" below jaw angle*
or (b) Along lower border of the jaw
Save: (a) Mandibular div. of facial nerve
(b) Lingual nerve
(c) *Hypoglossal nerve*
Tie: (a) Facial vessels
(b) Wharton's Duct
Excise: Submaxillary salivary gland

(E) **Upper deep cervical:**
Incision: (a) Skin: crease
(b) Deep: along anterior sternomast. border

Save : (a) Superficial sensory nerves
(b) Spinal accessory nerve
(c) Facial : cervical branch
(d) Hypoglossal nerve
(e) Vessels : carotid artery
int. jug. vein

Tie . (a) *External jugular vein*
(b) Common facial vein
(c) Int. jug. vein (if necessary)

(F) **Lower deep cervical :**

Incision . Crease, 2 inches above clavicle

Save . (a) Spinal accessory nerve
(b) Vagus nerve
(c) Brachial plexus with branches
(d) Int. jug. vein
(e) Thoracic duct

Tie . (a) Ext. jug. vein
(b) Transverse cervical vessels
(c) Suprascapular vessels

After-treat : (1) Anti-shock
(2) Immobilization of head and neck
(3) Sitting posture
(4) Removal of tubes after 36 hours

Compl . (1) Hæmorrhage :
Never cut tissues under tension
Never cut without previous clamping
Never tear away
(2) Air embolism . flood the wound with saline
(3) Injury to thoracic duct
pressure bandage
reopen and ligature
(4) Injury to important nerves

(3) MEDIASTINAL OR TRACHEO-BRONCHIAL GROUP .

Etio Childhood bovine
Adults : human

Clinic . (a) General toxæmia and cachexia
(b) Intermittent pyrexia
(c) Paroxysmal cough
(d) Parasternal cold abscess
(e) X-Ray

Compl . (A) Abscess formation with pressure
(a) Trachea : dyspnœa
(b) Bronchus lung collapse, consolidation
(c) Oesophagus : dysphagia
(d) Recurrent laryngeal : altered voice
(e) Sup. vena cava : prominent veins

(f) Vagus: tachycardia
(g) Sympathetic: abnormal pupil
(h) Thoracic duct: chylothorax

(B) Abscess formation with rupture
(a) Trachea: aspiration pneumonia
(b) Pleura: empyema
(c) Pericardium. pyopericardium
(d) Œsophagus: pyoemesis
(e) Post mediastinum: cold abscess → sinus
(f) Ant. mediastinum: cold abscess → sinus

Treat: Conservative

(4) AXILLARY GROUP:

Etio: (a) Part of **generalized T. B.** infection
(b) **Extension from cervicals**
(c) **Secondary to septic** chronic inflammation from catchment area

Treat: (1) Generalized conservative
(2) Local. primary excision
Incision: Parallel to and behind ant. axillary fold
Save: (a) Nerves:
anterior thoracic
long subscapular
thoraco-dorsal
long thoracic
brachial cords and branches
(b) Axillary vessels

(5) INGUINAL GROUP: Rare

Etio. (a) Secondary to septic chronic lymphadenitis
(b) Bloodborne

Diff. diag: (a) Septic glands
(b) Venereal glands

Treat. (1) Conservative in early stages
(2) Excision

Incision: (a) Transverse supra-poupart
or (b) Vertical along saphenous vein
or (c) Curved flap

Save (a) Arteries: external iliac and femoral
(b) Veins iliac and femoral
(c) Nerves. femoral with branches
ilioinguinal

(6) MESENTERIC AND RETRO-PERITONEAL GROUPS:

Etio:
Age: Children
Source: (a) Primary
(b) Secondary: intestines, lungs

Path : (a) Caseation → suppuration → peritonitis
(b) Calcification

Clinic : (a) **Tender mass**
(b) **Cystic swellings**
(c) **X-Ray shadows**

Clinical types : (1) **Acute :** Acute abdomen in cachectic patient
(2) **Chronic :** Chronic abdomen in „ „
(3) **Residual :**
(a) Colics and intestinal obstruction
(b) Abdominal mass or cystic tumour

Diff. diag : (1) Acute abdomen
(2) Chronic abdomen . surgical dyspepsia
(3) Abdominal tumour or cyst
(4) Stone shadows

Complications (1) **Adhesion effects :** Intestinal obstruction
(2) **Pressure effects :** Ascitis
(3) **Rupture effects :** Peritonitis

Treat . (1) **Conservative**
(2) Operative : if caseation or complications

(B) SYPHILITIC LYMPHADENITIS :

(1) PRIMARY CHANCRE :

(1) **Genital** chancre . discrete and shotty
(2) **Extra-genital** chancre · **indurative œdematous**

(2) SECONDARY SYPHILIS :

(a) Generalized, painless, discrete, shotty
(b) **No periadenitis**
(c) No caseation

(3) TERTIARY :

(a) Gumma rare
(b) Secondary to infection from broken down gumma

VII. LYMPHO-GRANULOMA : HODGKIN'S DISEASE

Def. : (1) Enlargement of lymphatic glands, liver and spleen
(2) Associated with anæmia
(3) In young adult males
(4) Due to **chronic progressive hyperplasia of hæmatopoietic tissues**

Etio : Males in third and fourth decades

Path : (1) Theories :

(A) **Infective:**

(a) Special form of tuberculosis
(b) Spirochætal
(c) Pleomorphic diphtheroid
(d) Ultra-microscopic virus

(B) **Granuloma:** Chronic progressive hyperplasia of hæmatopoietic tissues

(C) **Lympho-blastoma:**

(2) Morb. anat: cellular hyperplasia of hæmatopoietic tissues

(3) Histology:

(a) Reticular cells
(b) **Endothelial cells**
(c) **Multinuclear giant cells**
(d) **Eosinophils**
(e) Fibroblasts or fibrous tissue

Clinic: (1) **Enlarged glands:**

Firm, elastic, **discrete,** mobile

(a) Progressive: from group to group
(b) No periadenitis
(c) No caseation

(2) **Enlarged liver and spleen**
(3) Secondary **anæmia** (microcytic)
(4) **Pel-Epstein:** Bouts of fever
(5) Cutaneous: pigmentation, pruritus, eruptions
(6) Pressure signs.

(a) Nerves: neuralgia
(b) Veins: effusion
(c) Lymphatics: œdema and chylous effusion
(d) Bile: jaundice
(e) Spinal cord—compression myelitis

(7) Bone: pathological fracture

Clinical varieties:

(A) DEGREE:

(a) **Acute** type
(b) **Chronic** type
(c) **Latent** type

(B) SITE:

(a) **Generalized:** Enlarged glands
(b) **Thoracic:** Dyspnœa, cyanosis, effusion
(c) **Abdominal:** Pain, jaundice, ascitis
(d) **Splenic:** Large spleen
(e) **Hepatic:** Large liver
(f) **Retroperitoneal:** Backache

Diagnosis: (*a*) **Biopsy**
(*b*) Gordon's biological test:
Encephalitis in rabbits after intra-cerebral injection of affected gland emulsion

Diff. diag. (*a*) T. B. glands
(*b*) Syphilitic glands
(*c*) Lymphatic leukæmia
(*d*) Lymphosarcoma

Compl: (*a*) Pressure signs
(*b*) Sarcoma

Prognosis: Fatal within three years

Treat: (1) Intravenous salvarsan
(2) **X-Rays and Radium**
(3) Local excision
Ind: (*a*) Biopsy
(*b*) Localized group affected
(4) Specific sera

VIII. NEW GROWTHS OF LYMPHATIC GLANDS

(1) LYMPHOSARCOMA:

Path: (*a*) Microscopic: small round celled
(*b*) Spread:
(α) Local infiltration
(β) Lymphatic

Clinic: **Rapidly progressive** glandular tumour **infiltrating** widely

Compl: (*a*) Adhesions to, infiltrations into and pressure upon important structures
(*b*) Fungations and ulcerations
(*c*) Hæmorrhage
(*d*) Cachexia

Treat: (1) **Deep X-Ray therapy**
(2) Radium
(3) Coley's treatment

(2) SECONDARY CARCINOMA

Anatomy: (1) **Visceral lymphatic system**
(2) **Parietal lymphatic system**
(A) **Fascial** Lymphatics: six areas
(*a*) Two cervical
(*b*) Two axillary
(*c*) Two inguinal
(B) **Skin** lymphatics:
areas *of half inch diameter connected* via fascial lymphatics
(C) **Muscular** lymphatics:
drain into fascial lymphatics

Pathology: (A) **Primaries:**
- (1) Carcinoma
- (2) Melanoma malignum
- (3) Lymphosarcoma
- (4) Teratoma malignum

(B) **Invasion:**
- (1) Lymphatic permeation
- (2) Lymphatic embolism
- (3) Direct infiltration

Clinic: (1) **Primary in catchment area:**
- (*a*) Detectable:
  - (α) Primarily
  - *or* (β) Secondarily
- (*b*) Undetectable:
  - (α) Retrogressed primary
  - *or* (β) Deep or latent primary

(2) **Glands: Progressive, infiltrative enlargement**
- (*a*) Rapid or slow
- (*b*) Hard or soft

Compl: (*a*) Adhesions to, infiltration into or pressure upon important structures
- (*b*) Fungation and ulceration
- (*c*) Hæmorrhage
- (*d*) Cachexia

Treat: (1) Surgical excision
- (2) Deep X-Rays
- (3) Radium

Special important glands in carcinomata of important organs:

(1) BREAST:

(A) **Internal mammary:** Radium implantation

(B) **Supra-clavicular:**
- (*a*) Radium
- (*b*) Excision

Ind: Carcinoma in upper quadrant

(C) **Apical axillary:**

Ind: Must be carefully removed in each case

(D) **Superior mediastinal:**

Path: Secondary to internal mammary
Clinic: Retrosternal pressure effects

(2) TESTIS: (A) **Para-aortic:**
- (1) At the level of renal veins
- (2) Along the œsophagus

(B) **Supra-clavicular**

(3) STOMACH:

Three lymph regions of the stomach:
- (a) **Hepatic**
- (b) **Splenic**
- (c) **Coronary**

(4) TONGUE:

- (a) **Apical:** Submental, bilateral cervical
- (b) **Marginal:** Submaxillary, superior cervical
- (c) **Posterior:** Bilateral superior deep cervical
- (d) **Central:** Bilateral superior and inferior cervical

(5) CHEEK:

- (a) Parotid
- (b) Preauricular
- (c) Submaxillary
- (d) Tonsillar
- (e) Main cervical chain

(6) RECTUM:

- (a) Inguinal: primary below the white line
- (b) **Mesorectal**
- (c) Internal and external iliac
- (d) Para-aortic
- (e) Supraclavicular

(A) EXCISION OF CERVICAL GLANDS FOR SECONDARY CARCINOMA

Anæsth: (a) Regional: intervertebral 2, 3, 4 C
(b) General

Tech: (A) Unilateral block dissection: Crile
- (a) Incision: irradiate
- (b) Dissection of flaps
- (c) Excision from below upwards of:
  - (1) Deep fascia with cellular tissues
  - (2) Submaxillary salivary gland
  - (3) Lower pole of parotid gland
  - (4) Sternomastoid
  - (5) Internal jugular vein
  - (6) Glands:
    - (α) Submental
    - (β) Submaxillary
    - (γ) Superior cervical
      - (a) Superficial
      - (b) Deep
    - (δ) Inferior cervical
- (d) Save: main nerves and arteries
- (e) Ligature: the artery supplying the primary

(B) Bilateral block Dissection:

As in A: but avoid ligature of internal jugular vein or postpone it for 3 weeks on the other side

(B) EXCISION OF AXILLARY GLANDS FOR SECONDARY CARCINOMA

(a) Incision: axillary part of breast incision
(b) Division of great pectoral
(c) Division of small pectoral
(d) Division of costo-coracoid membrane from clavicle
(e) Clearing of axilla: from apex downwards
from without inwards
(f) Save only.
(1) Nerve of Bell
(2) Long subscapular nerve
(3) Superior thoracic artery
(4) Main nerves and vessels

(C) EXCISION OF INGUINAL GLANDS FOR SECONDARY CARCINOMA

(a) Incision (1) T-shaped
(2) U-shaped
(b) Reflection of flaps
(c) Dissection of deep fascia with glands
(α) Transverse superficial chain
(β) Vertical superficial chain
(γ) Deep glands
(δ) External iliac glands
(d) Save:
(α) Femoral vessels
(β) Femoral nerve

(3) SECONDARY MELANOMA MALIGNUM

Path: Dissemination by: into:

(1) Lymphatic permeation: the trunk lymphatics
(2) Lymphatic embolism: the regional lymph nodes
(3) Blood stream: anywhere: l u n g s, liver, brain, bones, etc.

Treat: (1) Excision of trunk lymphatics with deep fascia in which they run from the primary to the glands
+ (2) Excision of the regional glands with deep fascia around them
Contraind: blood metastases

IX. OTHER CAUSES OF ENLARGED LYMPH GLANDS

(1) LYMPHATIC LEUKAEMIA:

Clinic: (a) Generalized enlargement of lymph glands
(b) Enlargement of spleen
(c) Anaemia

Sign: Blood exam: enormous leucocytosis with relative enormous lymphocytosis

(2) STILL'S DISEASE:

Clinic: (a) Children
(b) Generalized enlargement of lymph glands
(c) Enlargement of spleen
(d) Anæmia
(e) Multiple osteoarthritis

(3) GLANDULAR FEVER: Infectious Mononucleosis:

Def.: Acute febrile and infectious adenitis with increase in mononuclear cells of the blood
Etio: Age: (a) School children
(b) Young adults
Path: Infection: (a) Virus
(b) Protozoon
Entry: (a) Throat
(b) Respiratory tract
(c) Digestive tract
Morb. anat. (a) Reticulo-endothelial hyperplasia
(b) Mononucleosis
Clinic: (A) Juvenile:
(a) Febrile stage: remittent → intermittent
(b) Adenitis: (α) cervical, (β) bronchial, (γ) mesenteric, rapid, painless, discrete, non-inflammatory but tender
(c) Enlargement of spleen
(B) Adult:
(a) Febrile stage: three weeks
(b) Enlarged glands
Signs: (1) Blood:
(a) Leucocytosis: 40,000
(b) Mononucleosis: 40%
(2) Paul-Bunnel reaction
Diff. diag: (A) Septic states:
(a) Tonsillitis
(b) Mumps
(c) Enteric
(d) Plague
(B) Gland affections:
(a) Septic
(b) T. B.
(c) Syphilis
(d) Hodgkin
(e) Leukæmia
(C) Referred pressure symptoms:
(a) Whooping cough
(b) Spinal cervical caries
(c) Appendicitis
Treat: Ultra-violet exposures

X. IMPORTANT POINTS

(1) Trauma:

(A) Causes of traumatic chylothorax:

(*a*) External violence:

(α) With fracture

(β) Without fracture

(*b*) Wounds:

(α) Operative

(β) Stab

(γ) Gunshot

(B) In traumatic chylothorax, effusion never occurs immediately after injury; there is a latent period of 2 to 6 days.

(C) Watery discharge from the wound, in operations on the neck root: ? trauma to thoracic duct.

(2) Acute lymphangitis:

(*a*) In acute lymphangitis, cellulitis, etc., look for association with metabolic diseases as an aggravating or predisposing factor.

(*b*) Every lymphangitis focus is a potential source of septicæmia.

(*c*) Under no circumstances should incisions be made into areas of lymphangitis or subcutaneous cellulitis, unless it is clear that there are definite local collections of pus which require to be evacuated

(*d*) No incisions into spreading cellulitis.

(*e*) In dealing with streptococcal or any septicæmia or toxæmia, real or potential, general treatment should always precede the local; no local interference should be allowed before the circulation is saturated with antiserum, which is ready to neutralize the toxins set free by the mechanical irritation of the local treatment.

(3) Lymphatic obstruction:

(*a*) Lymphatic obstruction is a valuable sign in:

(α) Carcinoma

(β) Filariasis

(*b*) Lymphatic œdema due to obstruction is a common sequela of excision of lymph glands or trunk lymphatics.

(4) Lymphadenitis:

	Group	Catchment
(a)	(1) Upper cervicals:	face, oral cavity, larynx and pharynx Three Ts: teeth, tongue, tonsils
	(2) Lower cervicals:	lung apex, thyroid, axilla and upper extremity
	(3) Posterior cervicals:	scalp
	(4) Axillary:	breast, upper extremity, lungs
	(5) Inguinal:	genitals, perineum, lower extremity

(b) Do not forget bubonic plague in a case of acute lymphadenitis

(c) Signs of acute appendicitis in children under 15 with no history of vomiting. look for septic focus on the foot.
? acute iliac lymphadenitis

(5) Tuberculous lymphadenitis:

(a) Chronic septic glands not going down within three months of the removal of primary focus in catchment area, *are tuberculous, especially if they tend to break* down.

(b) Tuberculosis enters the human portals by three routes:
(1) Pharynx: tonsils and adenoids
(2) Bronchial tree
(3) Last part of the ilium

(c) In every case of tuberculous lymph glands, find out and treat any septic focus in the catchment area.

(d) With the exception of pyogenic infection, tuberculosis is the commonest cause of enlarged cervical glands; syphilis and malignant metastases are other common causes

(e) Pathological varieties of T. B. glands neck:
(α) Caseous: abscesses
(β) Lymphoid: discrete swellings
(γ) Fibrous: matting

(f) Tonsils and adenoids should be removed in every case of T. B. cervical glands, even if they do not seem to be diseased.

(g) Differential diagnosis between a collarstud abscess and inflamed branchial cyst.

(6) (a) Operations for T. B. glands neck:—
(1) Aspiration of caseous material
(2) *Incision and drainage*
(3) Incision, evacuation and curettage
(4) Intra capsular enucleation
(5) Radical excision.

(*b*) In collarstud abscess, enlarge the fascial hiatus and scrape out the underlying tuberculous gland.

(*c*) All incisions in the neck for removal of lymph glands, should be transverse, along the anatomical creases and along the lines of stress; there is no mass of cervical glands, however large, that cannot be removed through a transverse incision.

(*d*) There should be no incision within one finger's breadth from the mandibular angle (danger to cervical branch of facial nerve).

(*e*) Sternomastoid branch of the occipital artery is a good guide to spinal accessory nerve, which runs deep to it.

(*f*) Avoid breaking through a caseous gland and infecting the cellular tissues of the neck by tuberculous debris.

(*g*) In neck operations, nothing must be cut which is not identified; do not cut any tissues under tension and without preliminary clamping.

(*h*) It is better to leave infection behind than to injure any important nerve trunk.

(7) New growths:

(*a*) Supraclavicular adenopathy
- (1) Carcinoma breast
- (2) Carcinoma œsophagus
- (3) Carcinoma thyroid
- (4) Carcinoma abdominal
- (5) Carcinoma testis.

(*b*) Systematic removal of all possible affected glands is imperative in all malignant tumours, except:
- (1) Rodent ulcer
- (2) Sarcomata of low malignancy
- (3) Carcinoma in lupus
- (4) Carcinoma in scar.

(*c*) In breast cancer, enlarged axillary glands are an indication of simultaneous affection of the internal mammary glands.

(*d*) Enlarged gland in the omohyoid triangle may be the first clinical indication of an unobserved testicular growth.

(*e*) Lymphatics of the tongue decussate freely across the midline; for growths anywhere on the tongue, except posterior two-thirds of lateral margins, bilateral gland excision is indicated.

(*f*) Efferent lymphatics of the tongue have a lower destination, further forward they arise in the tongue. The disease spreads rapidly along the glands of the main chain.

(g) Growths of the anal canal below the white line metastases in the inguinal glands on both sides.

(h) Removal of all the draining glands must be done in:
(1) Sarcoma tongue
(2) Sarcoma testis
(3) Sarcoma tonsils
(4) Sarcoma breast
(5) Melanotic sarcoma.
It may not be done in fibrosarcoma

(8) (a) In every case of either (1) enlarged lymph glands or (2) enlarged liver or (3) enlarged spleen, examine for the enlargement of all Examine blood in each case.

(b) Discovery of non-inflammatory enlargement of solitary *lymph glands in unusual situations : think of chronic* lymphatic leukæmia.

(c) Biopsy is the most important and certain step in the diagnosis of a glandular enlargement.

(9) (a) Main causes of glandular enlargement:

Cause	*Site*	*Signs*
(A) Acute lymphadenitis:	Local:	Acute sepsis in catchment area
(B) Chronic lymphadenitis:	Local:	Chronic sepsis in catchment area
(C) T.B. glands:	(a) Local:	Periadenitis, caseation
	or (b) General:	Lymphoid type
(D) Syphilis:	(a) Local:	Primary chancre
	↓ (b) General:	Secondary syphilitic signs. No periadenitis and caseation
(E) Malignant:	Local:	Hardness and infiltration Primary growth in catchment area
(F) Hodgkin:	(a) Local:	No periadenitis, no caseation
	↓ (b) Neighbouring:	Enlarged liver and spleen
	↓ (c) General	Enlarged liver and spleen
(G) Lymphosarcoma:	(a) Local:	Rapid irregular infiltration and growth
	↓ (b) Regional	
(H) Lymphatic leukæmia:	General:	Lymphocytosis

(b) Causes of local growth:

(1) Acute or chronic septic
(2) Tuberculosis: early
(3) Primary chancre
(4) Malignancy

Causes of general growth

(1) Tuberculosis: generalized type
(2) Secondary syphilis
(3) Hodgkin: later stage
(4) Leukæmia

(c) Causes of enlargement of special groups

	Group	*Causes*
(1)	Occipital:	Septic focus in catchment area
(2)	Preauricular:	Sepsis, epithelioma, rodent ulcer, lupus, chancre
(3)	Submental:	Sepsis, chancre, carcinoma of the tip of the tongue
(4)	Submaxillary:	Sepsis, Carcinoma } in oral cavity
(5)	Superior cerv:	(*a*) Sepsis: facial, oral, pharyngeal (*b*) Tuberculosis (*c*) Secondary carcinoma (*d*) Syphilis (*e*) Hodgkin (*f*) Lympho-sarcoma
(6)	Post-cervicals:	(*a*) Sepsis (*b*) Syphilis
(7)	Supra-clavicular:	(*a*) Tuberculosis: lung apex, axillary (*b*) Carcinoma: breast, abdominal, testis
(8)	Axillary:	(*a*) Sepsis: breast, superior extremity (*b*) Tuberculosis (*c*) Secondary carcinoma breast (*d*) Hodgkin
(9)	Epitrochlear:	(*a*) Syphilis (*b*) Sepsis
(10)	Peritoneal:	(*a*) Tuberculosis (*b*) Carcinomatous (*c*) Hodgkin
(11)	Iliac:	(*a*) Sepsis: from foot (*b*) Tuberculosis

(12) Inguinal + Femoral
- (a) Sepsis: genital, inferior extremity
- (b) Venereal: syphilis, softsore, etc.
- (c) Secondary: Carcinoma or melanoma

(13) Popliteal: Sepsis

(10) Glandular fever:

(a) Mononucleosis is characteristic of glandular fever

(b) There are two types of glandular fever

(1) Juvenile: adenitis $>$ fever

(2) Adult: fever $>$ adenitis

CHAPTER VII

THE BONES

I. ANATOMY

(A) PARTS:

- (1) Diaphysis:
  - (a) Cortex
    - (α) Haversian canals
    - (β) Lacunæ
    - (γ) Canaliculi
  - (b) Cancellous
  - (c) Marrow
- (2) Mataphysis: Diaphyseal side of epiphyseal cartilage
- (3) Epiphyseal cartilage
- (4) Epiphysis
- (5) Articular cartilage
- (6) Periosteum:
  - (a) Fibrous, outer layer
  - (b) Epiosteum: germinal layer

(B) BLOOD-SUPPLY:

- (1) Nutrient system: Marrow
- (2) Periosteal system: Cortex and periosteum
- (3) Metaphyseal system
  - (a) Metaphysis
  - (b) Epiphysis
  - (c) Synovial membrane

(C) DEVELOPMENT:

- (1) Epiphyseal:
  - (a) Zone of cartilage proliferation
  - (b) Zone of provisional calcification
  - (c) Zone of ossification
- (2) Periosteal: From the epiosteum
- (3) Membranous: Skull bones

(D) METABOLISM:

Calcium content of the bone is a chemical equilibrium between

(a) Crystalline calcium phosphate of bone

\+ (b) Ionised and non-ionised calcium phosphate of blood

Absorption, storage, and elimination of calcium are affected by:

(a) Vitamine D

(b) Internal hormones, esp. parathormone

(E) FORMATION:

(1) Requisites for bone formation are:
 (a) Ossifiable medium from undifferentiated connective tissue
 (b) Local deposit of calcium
 (c) Adequate blood-supply: for assimilation of calcium

(2) Factors in the bone formation are:
 (a) Formation: osteoblasts: produce preosseous tissue
 (b) Resorption:
  (α) Osteoclasts
  (β) Conversion of insoluble bone calcium into soluble blood calcium

(3) Role of circulation in bone formation:
 (a) Hyperæmia → osteoporosis
 (b) Anæmia → osteosclerosis
 (c) Absence or severance → necrosis

II. CONGENITAL AFFECTIONS OF THE BONES

(A) DISTURBANCES OF OSSIFICATION:

(1) ACHONDROPLASIA:

Def Intrauterine disturbance of endochondral ossification
leading to
Premature union of epiphyses of long bones and skull base

Etio. Incidence: hereditary and familial
Cause: abnormal internal secretion
↓ abnormal bone-growth regulation

Clinic. (1) Low stature
(2) Big vertex with small base
(3) Short extremities with spade hands
(4) Normal
 (a) Trunk
 (b) Intellect
 (c) Sexual development

(2) ANOSTEOPLASIA · Cleido-cranial Dysostosis

Def. Imperfect ossification of membranous bones

Clinic. (a) Ill-formation of vertex skull with delayed closure of fontanelles
(b) Ill-formation of clavicles
(c) Delayed ossification of pubic bones

(B) FRAGILITAS OSSIUM: Osteogenesis Imperfecta

Def: Undue fragility of bones leading to spontaneous and multiple fractures

Varieties: (1) Foetal: Osteogenesis imperfecta congenita
(2) Infantile
(3) Fragilitas osseum tarda
(4) Osteosclerosis fragilis generalizata
 (Syn.): Albers-Schonberg
 : Marble bones
 : Osteopetrosis

Path: Fairbank's classification

(1) Thick bone type: congenital

(2) Slender fragile bone type } Fragilitas Tarda

(3) Honeycomb bone type }

(4) Marble bone type: Albers-Schonberg

(1) OSTEOGENESIS IMPERFECTA CONGENITA: Fœtal type

Etio: ? Parathyroid disturbance

Path: Defective osteoblastic action

↓ Undue bone fragility

Clinic: Multiple idiopathic fractures at birth: with

(α) good union

(β) deformities

(2) FRAGILITAS OSSIUM TARDA:

Etio: Hereditary and familial

Path: Hypoplasia of mesenchyme. (mesoblast)

Clinic: (1) Multiple fractures with good union: Between the age of 3 and 17

(2) Blue sclerae and early arcus senilis

(3) Abnormal laxity of ligaments

: Tendency to sprains and dislocations

(4) Generalized muscular atrophy

(5) Osteosclerotic progressive deafness

(6) Gross osseous deformities

(7) Abnormal skull: bulging temporals and occiput

(8) X-Rays: Thin cortex + Honeycomb medulla

Treat: (1) Local: treat the fractures

prevent the fractures and sprains

(2) General: calcium; parathormone, thymus

(3) OSTEOSCLEROSIS FRAGILIS GENERALIZATA

Albers-Schonberg disease

(Syn: Osteopetrosis; Marble bones)

Def: Irregular areas in the bones, of:

(a) Uniformly calcareous marblelike sclerosis

\+ (b) Osteoporotic thinning and rarefaction

Etio: Hereditary and familial

Any age

Path: (1) Reduction of bone medullary cavity and marrow

(2) Pressure effects on cranial nerves

Clinic: (1) Aplastic anæmia:

(a) Anæmia

(b) Enlarged: (α) liver, (β) spleen, (γ) lymph glands

(2) Hydrocephalus

(3) Cranial nerve palsies

(4) Idiopathic fractures

III. TRAUMA

(I) PERIOSTEAL INJURIES:

(A) PERIOSTEAL CONTUSION:

Sub-periosteal hæmatoma

Etio: Direct injury

Clinic: Painful, tender, fixed swelling after injury

Sites: (1) *Ribs*, (2) *Mandible*, (3) *Skull*

Diff. diag: (1) Subcutaneous contusion or hæmatoma
(2) Muscular contusion or hæmatoma
(3) Bony affections: trauma, inflammation, tumour

Compl. (1) Ossification: node formation
(2) Traumatic periostitis → sub-periosteal abscess
(3) Periosteal adhesion → constant pain

Treat: (1) Rest and cold + pot. iodide
↓ (2) If inflammation → suppuration
(*a*) Fomentations
↓ (*b*) Incision and evacuation

(II) FRACTURES:

GENERAL CONSIDERATIONS

Def. Solution of continuity of a bone

Etio: (1) Age: (*a*) Toddling; (*b*) Senility
(2) Sex: (*a*) Males, (*b*) Old females
(3) Occupation: laborious; athletes
(4) General health: debility
(5) Bone diseases.
(A) General:
(1) Congenital and familial fragility
(2) Disuse atrophy
(3) Neuropathic diseases
(4) Metabolic disturbances:
(*a*) Osteomalacia
(*b*) Rickets
(*c*) Osteitis deformans
(*d*) Fibrocystic disease
(B) Local.
(1) Location: exposure to trauma
(2) Inflammation: osteomyelitis
(3) Atrophy
(4) New growth:
(*a*) Sarcoma → non-union
(*b*) Carcinoma } → union
(*c*) Myeloma }
(*d*) Hypernephroma
(*e*) Cysts
(5) Erosions: aneurysm

Causes: (1) **Traumatic:**
- (a) Direct
- (b) Indirect
- (c) Muscular violence

(2) **Spontaneous: Idiopathic**
: due to general diseases with bones normal

(3) **Pathological:**
: due to bone abnormality

VARIETIES OF FRACTURES

(1) IN RELATION TO EXTERNAL WOUND

(A) **Closed:** Simple

(B) **Open:** Compound
- (a) Direct open
- (b) Indirect open: through air sinuses
  : fragments piercing the skin from within

(2) IN RELATION TO ETIOLOGY

(I) TRAUMATIC FRACTURES:

(A) BIRTH FRACTURES:

(1) INJURIES:

(a) **Shaft of the humerus:**
Etio: Breech presentation
Clinic: Dangling arm
Treat: Arm strapped to the chest over a pad of cotton wool in moderate abduction

(b) **Shaft of the clavicle:**
Etio: After-coming head
Clinic: Callus lump
Treat: Sling for two weeks

(c) **Shaft of the femur:**
Etio: Breech presentation
Cæsarean section
Treat: Gallows splint with vertical suspension for four weeks

(d) **Depressed fracture skull:**
Etio: Slightly contracted pelvis
Clinic: Parietal hæmatoma, Depression or furrow
Treat: (1) Conservative
(2) Elevation

(e) **Epiphysial displacements:**

(α) **Lower femoral:**

Treat: (1) Traction with knee flexed
(2) Vertical suspension

(β) **Lower humeral:**

Clinic: Swollen unmobile elbow
Treat: Traction
↓ Sling with elbow at right angles.

(2) CONGENITAL FRAGILITY OF BONES
: Osteogenesis imperfecta congenita.

(3) CONGENITAL PSEUDARTHROSIS OF TIBIA

Etio: Unknown
Path: Fracture with persistent non-union
Site Junction of middle and lower third
Compl: Talipes equinus
Treat: (1) Calliper splint
↓ Bone graft (after puberty).
(2) Fibular graft.

(B) TRAUMATIC FRACTURES

(II) PATHOLOGICAL FRACTURES: (Diseases of the bones)

(A) BONE ATROPHY, OSTEOPOROSIS, DECALCIFICATION

(1) Disuse bone atrophy
(2) Poliomyelitis
(3) Senile osteoporosis
(4) Hyperæmic decalcification
(5) Infective decalcification (osteomyelitis)
(6) Rickets
(7) Osteomalacia
(8) Cœliac disease, steatorrhea and sprue
(9) Idiopathic juvenile osteoporosis

(B) BONE TUMOURS AND CYSTS:

(1) **Bone cysts and osteitis fibrosa**

(a) Solitary bone cyst
(b) Variants of bone cyst
(c) Hyperparathyroid osteitis fibrosa
(d) Pagets' disease: osteitis deformans

(2) **Bone Tumours:**

(a) **Benign:**

(α) Chondroma & chondromyxoma
(β) Giant celled tumours
(Υ) Angioma

(b) **Malignant:**

(1) **Primary:**

(α) Osteolytic sarcoma
(β) Ewing's sarcoma
(γ) Multiple myeloma

(2) **Secondary:**

(α) **Carcinoma:**

Breast
Prostate
Thyroid
Kidney
Bronchus

(β) **Hæmopoietic:**

(i) Hodgkin
(ii) Chloroma
(iii) Hand-Schuller
(iv) Gaucher

(C) CONGENITAL FRAGILITY OF BONES

(α) **Osteogenesis imperfecta:**

(a) Fœtal
(b) Infantile
(c) Adolescent

(β) **Osteosclerosis fragilis:**

Albers-Schonberg

(III) SPONTANEOUS FRACTURES: General diseases with normal bones

Factors: muscle inco-ordination
fatigue
loss of sensations

(1) Tabes dorsalis
(2) Syringomyelia
(3) Epilepsy
(4) March fracture with metatarsus atavicus

(3) IN RELATION TO CAUSATIVE VIOLENCE

(1) Traction: separation of processes
(2) Compression: vertebræ, os calsis
(3) Flexion
(4) Torsion

(4) IN RELATION TO THE EXTENT AND NATURE

(1) Complete
(2) Incomplete
(3) Separation of epiphysis

(5) IN RELATION TO THE SHAPE OF BROKEN ENDS

(A) **Complete:**
- (a) Transverse
- (b) Oblique
- (c) Spiral
- (d) Butterfly
- (e) Comminuted

(B) **Incomplete:**
- (a) Sub-periosteal crack
- (b) Green stick
- (c) Fissured
- (d) Depressed
- (e) Pond-shaped
- (f) Star-shaped

(6) IN RELATION TO POSITION OF BROKEN ENDS

- (A) Impacted
- (B) Non-impacted
- (C) Separated
- (D) Interposed

(7) IN RELATION TO TRAUMA TO OTHER STRUCTURES

Complicated: (a) Trauma to nerves, vessels, joints, viscera
(b) General complications

Clinical features of fractures:

(1) **History of Injury:**
- (a) Grave
- (b) Ordinary
- (c) Negligible

(2) **General condition:**
- (a) Shock
- (b) Febrile reaction

(3) **Pain:**
- (a) Local
- (b) Referred

(4) **Loss of function:** Due to:
- (a) Pain
- (b) Spasm
- (c) Deformity
- (d) Paralysis

(5) **Superficial signs of injury:**
- (a) Present: in direct fractures
- (b) Absent: in indirect fractures

(6) **Deformity:**

Types: (A) Altered length: (*a*) Shortening
(*b*) Lengthening

(B) Angulation
(C) Rotation
(D) Lateral displacement

Accessory factors:

(A) Œdema or hæmatoma
(B) Distension of joints
(C) Spasm of muscles

Clinic. (*a*) **Inspection:**

(α) Angulation
(β) Torsion
(γ) Broadening

(*b*) **Palpation:**

: Relative positions of bony points

(*c*) **Mensuration:**

: From and to fixed points on affected and sound sides

Causes: (1) Initial violence
(2) Contraction of muscles
(3) Gravity
(4) Extravasations
(5) Manipulations

(7) **Crepitus:** Felt or/and heard

Present in: (*a*) **Fractures**
(*b*) Osteoarthritis
(*c*) Tenosynovitis
(*d*) Surgical emphysema

Absent in: following fractures
(*a*) Incomplete
(*b*) Impacted
(*c*) Separated
(*d*) Interposed

Soft in: separation of epiphysis

(8) **Abnormal mobility:** (should not be elicited)
(*a*) Abnormal mobility in the course of a bone
(*b*) Failure of the end to move when shaft is moved

(9) **X-Rays:**

(1) **Planes:**
(*a*) Anteroposterior
(*b*) Lateral
(*c*) Oblique
(*d*) Stereoscopic

(4) **Time:** Till union is sound
Upper limb: 4–6 weeks
Lower limb: 8–12 weeks

(5) **Removal:**
(*a*) Be extremely gentle and cautious
(*b*) Removal of half
↓ Removal of the bed

(6) **After-treatment of removal:**
Elastoplast support
Massage and movements
Physiotherapy

(7) **Complications of plaster**
: (See above)

(B) CONTINUOUS TRACTION WITH COUNTERTRACTION AND PLASTER:

Ind: (1) Deep fractures
(2) Difficult manipulative reduction
(3) Difficult fixation after reduction
(4) Lower extremity fractures

(1) **Fixed or passive traction: By splints or plasters**

	Apparatus	*Point de appui*
(1)	Thomas' splint	Tuber ischii same side
(2)	Abduction frame:	Groin strap opposite side
(3)	Well-leg traction	Opposite sole
(4)	Roger-Anderson	Opposite sole
(5)	Plasters.	

(*a*) Whitman
(*b*) Incorporated traction pins

(2) **Mobile or active traction: By Pulley and Weights**

(A) **Indirect:**
(*a*) Adhesive strapping method
(*b*) Vertical suspension method
(*c*) Splint traction method
(α) Braun
(β) Hodgen
(γ) Suspended splint

(B) **Direct or skeletal:**
(*a*) Traction pins
(*b*) Traction wires
(*c*) Traction callipers
(*d*) Traction tongs

(3) **Combined, fixed and mobile traction:**

Thomas splint with weight traction
Raising the foot of the bed

(C) OPERATIVE REDUCTION, FIXATION AND PLASTER

Ind: (1) Difficult or failed reduction by conservatism
(2) Difficult retention of reduced fracture
(3) Persistent great displacement inspite of efficient traction
(4) Non-union
(5) Special features:
(*a*) Interposition of soft parts
(*b*) Avulsion of processes
(*c*) Fear of cross-union
(*d*) Where perfect alinement is necessary

Operation: (1) **Simple impaction and soft tissue suture**

(2) **Suturing:**
(*a*) Absorbable sutures
(*b*) Non-absorbable sutures
(*c*) Metal sutures
(*d*) Fascial sutures

Ind: Olecranon, patella

(3) **Excision:** Patella, head of radius

(4) **Plates and screws**

Ind: Transverse fracture shaft of femur

(5) **Wires and bands**

Ind: Oblique or spiral fractures of long bones

(6) **Bone grafting**

Ind: (1) Transverse fractures of shafts
(2) Fractures of processes
(3) Non-union

Sources: (1) Auto, (2) Homo, (3) Hetero

Tech: (1) Intramedullary
(2) Inlay surface

Varieties: (1) Massive: cortical
(2) Bone chips
(3) Bone marrow

(7) **Nailing**

Ind: Bone processes
Neck of the femur

Varieties: Ivory, bone, metal pins

(8) **Intramedullary pegs**

Ind : Transverse fractures of shafts

Varieties : Ivory; bone

Methods of Fixation of reduced fracture :

(1) **First aid :** Improvised splint
(2) **Sand-bags :** Fracture femoral neck in very old
(3) **Bandages :** Jaw
(4) **Strapping :** Ribs, clavicle
(5) **Binders :** *Crack fractures of pelvis*
(6) **Splints**
(7) **Plasters**
(8) **Traction :** Mobile : (*a*) indirect, (*b*) direct
(9) **Operative fixation**

(III) RESTORATION OF FUNCTION :

(1) **Massage :** On the day following reduction
(2) **Active movements :**
 (*a*) Of non-included joints : immediate after reduction
 (*b*) Of included joints : immediate after removal of plaster
(3) **Passive movements :** Gradual, short of pain
(4) **Weight bearing on appliances :** Callipers & boots
 After firm union
(5) **Weight bearing on the fractured bone :**
 After ossification of the union
(6) **Physiotherapy :**
 (*a*) Non-included parts : immediate
 (*b*) Included parts immediate after removal of plaster

OPEN AND INFECTED FRACTURES

Etio varieties (1) **External :** Outside violence penetrating upto and fracturing the bone
(2) **Internal :** Fractured ends piercing the skin from inside

Classification : (1) *Indirect communication : air sinus, pharynx*
(2) Puncture secondary to fracture
(3) Laceration of soft tissues upto fracture
(4) Laceration of soft tissues + Comminuted fracture
(5) Gunshot wounds + fracture

Complications : (1) **Pyococcal infection :** Acute and chronic
(2) **Anærobic infection :** Tetanus and gas gangrene
(3) **General infection :** Septicæmia, pyæmia
(4) **Abnormal union :** Non and mal union

Treatment:

(A) OPEN FRACTURES WITHIN 24 HOURS:

(1) **First aid:**
- (*a*) Temporary immobilization in deformed position
- (*b*) Iodine dressings
- (*c*) **Treat hæmorrhage and shock**
- (*d*) Anti-tetanus and anti-gas gangrene serum
- (*e*) Chemo-therapy

(2) **Radiography**

(3) **Debridement:**
- (*a*) **Removal of every non-viable particle**
- (*b*) Removal of completely isolated bone fragments
- (*c*) Removal of foreign bodies and dirt
- (*d*) No irrigation; **no antiseptics**

(4) **Sutures:**
- (*a*) Suture only severed important tissues
- (*b*) No deep approximation
- (*c*) **Avoid catgut ligatures**

(5) **Manipulative reduction:**

Methods: (*a*) **Open:** Before suture of tendons and nerves
(*b*) **Closed:** After skin sutures

(6) **Plaster with window or pin extension with splint**

(B) OPEN FRACTURE AFTER 24 HOURS:

Varieties: (1) Fractures seen after 24 hours
(2) Potentially infected fractures: seen at any time
: grossly soiled
(3) Obviously infected fractures
(4) Failure of primary excision and debridement

Technics: (A) **Splint and traction pin method:**

Ind: (1) **Fractures seen after 24 hours**
(2) **Potential infection**

Tech: (1) Anæsthesia: not local
(2) Preparation of the limb
(3) Insertion of Steinmann pin
(4) Debridement
(5) Antiseptic wash
(6) Flavine and paraffin pack
(7) Splint and weight traction

(B) **Winnet orr**

Ind: (1) **Failure of primary debridement**
(2) **Infected fractures**

Tech: (1) Anæsthesia: not local
(2) Preparation of the limb
(3) **Complete saucerization**

(4) Vaseline pack
(5) *Complete plaster*
(6) Traction skeletal: (if necessary)

Fracture : *Site of pin*
(*a*) Femur : Tibial tubercle
(*b*) Upper tibia : 1.5 inches above ankle
(*c*) Lower tibia: *Os calcis*

After-treat: (1) Removal at the end of five weeks: of
(*a*) Plaster
(*b*) Sequestra
(*c*) Traction pin
(2) Two-monthly changes of plaster till fracture is united

Post-compl.: (1) Imperfect drainage: fever
(2) Plaster complications
(3) Pin complications
(4) Secondary hæmorrhage
(5) Sinus formation

(C) Amputation:

(1) **Primary: Prophylactic** (should be rare)

Ind (*a*) Limbs **Crushed** out of recongnition
(*b*) Limbs: Very grossly lacerated + **Grossly manure-soiled**
(*c*) Limbs: *Badly crushed in*
(α) **Old people**
(β) Debilitated people
(γ) *Diseased people*

(2) **Delayed: As soon as indications are evident**

Ind: (1) *Established* **gangrene**
(2) Anærobic gangrene
(3) Creeping up **infection**: : inspite of local and general treatment
(4) Generalized infection: : inspite of local and general treatment

(3) **Secondary: Not too late just as not too early**

Ind: Chronic **persistent infection** with patient gradually going down

Tech : (1) Primary : Amputation of choice
(2) Delayed : Guillotine amputation at the lowest level of safety and without closure
(3) Secondary : Amputation at the highest level of safety with closure but drainage

Complications of delayed or inefficient treatment of open fractures :

(A) **Local** : (1) Suppuration
(2) **Necrosis** with sequestration
(3) Non-union

(B) **Regional** : (1) Infection and adhesions of tendons & muscles
(2) Infection and ankylosis of joints

(C) **General** : Septicæmia; pyæmia

(D) **Special** : (1) Tetanus
(2) **Gas gangrene.**

INDIVIDUAL FRACTURES

(1) MAXILLA :

Etio : (1) Direct trauma
(2) Tooth extraction

Sites : (1) Antral wall
(2) Alveolus

Path : **Compound**

Clinic : (1) Deformity
(2) Painful bite

Compl : (1) Subcutaneous hæmatoma
(2) Surgical emphysema
(3) Osteitis with **necrosis**
(4) **Antritis** (sinusitis)
(5) Aspiration pneumonia
(6) Deformity

Treat : (1) Lead lotion
(2) Mouth and nasal irrigations
(3) Reduction . (*a*) Closed bimanual (*b*) Open
(4) Fixation : (*a*) Face strap (*b*) Dental splint

(2) ZYGOMA :

Etio : Direct trauma : **football**
Path : Arch displaced down and in

Clinic: (1) Deformity
(2) Lockjaw
(3) Infraorbital anæsthesia

Compl: (1) Deformity
(2) Injury to infraorbital nerves

Treat: Reduction:
(a) Digital bimanual
(b) Hook
(c) Open leverage

(3) NASAL:

Etio: Direct trauma: (1) Lateral impaction
(2) Vertical impaction

Path: Depression or lateral deviation

Clinic: (1) Hæmorrhage
(2) Deformity with swelling
(3) Surgical emphysema

Compl: (1) Deformity: **depressed bridge**
(2) Sepsis

Treat: (1) **Reduction: by rubber covered sinus forceps**
(2) Fixation: by antiseptic pack

After-treat. Nasal irrigations

(4) MANDIBLE:

(A) CANINE FOSSA:

Etio: Direct blows on chin

Path: (1) Compound into oral cavity
(2) Displacement: down and back

Clinic: (1) Painful bite
(2) Bloodstained saliva
(3) **Irregular line of teeth**
(4) Associated contusion of lip & soft parts

Compl: (1) Sepsis with necrosis
(2) Delayed union: mal-union
(3) Submaxillary cellulitis
(4) Aspiration pneumonia

Treat. (1) Reduction: by manipulations
(2) Fixation: by: (a) Four-tailed bandage
(b) Dental plate
for: three weeks

After-treat: (1) Tubal liquid feeds
(2) Gargles for three weeks

(B) ANGLE:

Etio: Direct trauma

Clinic: (1) Painful bite
(2) Bloodstained saliva
(3) **Altered line of teeth**
(4) Local: tenderness with **crepitus**

Compl: As in (A)
Treat: (1) Reduction: by manipulations
(2) Fixation: by: Four-tailed bandage
for: Three weeks
After-treat: (1) Tubal liquid feeds
(2) Gargles

(C) CORONOID PROCESS:

Etio: Blows on open chin
Path: Displacement. (*a*) nil or (*b*) upwards
Clinic: (1) Painful bite
(2) **Absence of temporal contractions**
Treat: (1) Four-tailed bandage
: for three weeks
(2) Wiring
After-treat. (1) Tubal liquid feeds
(2) Oral antisepsis

(D) CONDYLE:

Etio: (1) Direct trauma
(2) Blows on chin
Clinic. (1) Painful movements
(2) Crepitus
(3) **Effusion into temporomandibular joint**
Compl: **Ankylosis** of temporomandibular joint
Treat: (1) Four-tailed bandage } three weeks
+ (2) Oral antisepsis }
(3) Excision of the condyle

Immobilization apparatus for fracture mandible

(A) **Bandages and straps**
(*a*) **Four-tailed bandage**
(*b*) **Barrel bandage**
(*c*) **Hamilton strap**
(*d*) **Fry's elastic support**
(B) **Orthopædic splints**
(C) **Wiring of teeth**

(5) CLAVICLE

(A) ACROMIAL END:

(1) Acromial tip

Etio: Direct trauma
Path: Displacement downwards
Clinic: (1) Local signs of trauma
(2) **Painful abduction**
(3) X-Rays
Treat: (1) Strapping and sling: for 3 weeks
(2) Wiring

After-treat: (1) Shoulder exercises: after three weeks

(2) **Between trapezoid and conoid ligaments:**

Etio: Direct trauma
Path: No displacement
Clinic: (1) Local signs of trauma
(2) X-Rays
Treat: Strapping and sling: for three weeks
After-treat: Shoulder exercises : after three weeks

(B) STERNAL END:

Etio: Direct trauma
Path: No displacement
Clinic: Local signs of trauma
Treat: Axillary pad and sling for three weeks

(C) SHAFT: Junction of curves

Etio: (1) Predisposers. **anatomical weakness** due to:
(*a*) Junction of curves
(*b*) Change in contour
(*c*) *Groove for subclavius*
(*d*) Nutrient foramen
(2) Exciting **falls on hand**
Path: (1) Complete or incomplete
(2) Displacement:
Outer fragment down + in + forwards
Clinic: (1) Decubitus:
(*a*) **Adducted arm with supported elbow**
(*b*) Deviated neck: to the same side
(2) Inability to abduct the arm
(3) **Local signs of fracture**
Compl: (1) **Mal-union** Sclerosis
(2) Pressure syndrome: (1) Nerves, (2) Vessels
(3) Treatment complication: pressure on axilla
Treat: (1) Sayre's strapping
(2) **Three handkerchieves and a sling**
(3) Cross splint and a sling
(4) **Figure of eight bandage and a sling**
(5) **Recumbency with central pillow**
(6) Plaster cast
(7) Open operation
After-treat: (1) **Fixation:**
by: (*a*) Sling
(*b*) Bandage
(*c*) **Strapping**
(*d*) Splint
(*e*) Plaster
for: **Three weeks**
over: An axillary pad

in: (*a*) **Elbow: flexed, forward and up**
(*b*) **Forearm: pronated**
(c) **Hand: on opposite shoulder**

(2) Exercises:
(*a*) Immediate: fingers, wrist, elbow
(*b*) Delayed: shoulder.

(6) SCAPULA

(A) HEAD AND NECK:

(1) **Glenoid cavity:**

Etio: Blows on shoulder
Path: Crack fracture with no displacement
Clinic: Synovial effusion in shoulder
Compl: **Ankylosis shoulder**

(2) **Anatomical neck:**

Etio: As in (1)
Path: Displacement downwards
Clinic: (1) Flattened shoulder with **effusion**
(2) Unduly prominent acromion
(3) **Lengthened arm**
(4) Crepitus
Diff. diag. Dislocation shoulder
Compl: As in (1)
Treat: (1) Support.
by: (*a*) Sling
(*b*) Abduction frame
for. Two weeks
(2) Traction.
by: Abduction frame
for: Four weeks
(3) Exercises and physiotherapy:
(*a*) Immediate: fingers, wrist, elbow
(*b*) After 10 days: shoulder

(3) **Surgical neck:**

Etio: As in (1)
Path: As in (2) + Coracoid process involved in displacement
Clinic: As in (2)

(4) **Acromion:**

Etio: As in (1)
Path: Slight displacement
Clinic: (1) Local signs of fracture
(2) **Painful deltoid action**

(5) **Coracoid process:**

Etio: (1) **Back fire** of gun

(2) Acromio-clavicular **anterior dislocation** of shoulder
Path: Slight displacement
Clinic: Local signs of fracture

(B) BODY of the scapula
Etio: Direct trauma
Path: Displacement: slight or nil
Clinic: Local signs of injury and fracture
Compl: (1) Fracture underlying ribs
(2) Hæmatoma
Compl: Of fracture scapula
(1) **Ankylosis shoulder**
(2) **Osteoarthritis shoulder**

Treatment of fracture scapula:
(1) **Reduction: By manipulations**
(2) **Fixation:**
In: (a) Arm by the side of the chest
or: (b) Shoulder abduction
by: (a) Sling
(b) Bandage
(c) Abduction splint
over: An axillary pad
for: Three to four weeks
(3) **Exercises and physiotherapy**
(a) Immediate: fingers, wrist, elbow
(b) Delayed: shoulder

(7) HUMERUS:

(A) UPPER END AND NECK:

Sites:
(1) **Anatomical neck:**
Etio: Direct trauma
Path: Displacement:
(a) Impaction
(b) Upper fragment downwards or forwards
Clinic: **Articular effusion**
(2) **Surgical neck:**
Etio: (1) Direct trauma
(2) Dislocation shoulder
Path: Displacement:
(a) Upper: abducted
(b) Lower: up and adducted
Clinic: (1) Round swollen shoulder
(2) Abrupt hollow below the shoulder
(3) Arm abducted and shortened
(4) **Head not moving with the shaft**
(5) Crepitus

(3) Separation of epiphysis
Etio: **Age between 6 and 20**
Clinic: (1) Age
(2) Soft crepitus
(3) Difficult reduction.

(4) Tuberosities:
(A) External
(B) Internal
Etio: (1) Dislocation shoulder } : **avulsion fracture**
(2) Muscle action }
(3) Direct trauma: **contusion fracture**
Path: Displacement in the direction of attached muscles
Clinic: (1) Palpation in abnormal position
(2) Attached muscles out of action
(3) Crepitus: (*a*) Present in contusion fractures
(*b*) Absent in avulsion fractures
Treat: (A) Fractures without displacement **(contusion)**
(1) **Sling for two weeks**
(2) Active exercises immediate
(B) Fractures with displacement **(avulsion)**
(1) Reduction: by manipulations
(2) **Fixation**: For external tuberosity
By: (*a*) Plaster of Paris
(*b*) Abduction frame
In: Abduction: 90°
Eversion: 60°
For: Eight weeks
(3) Active exercises:
Distal joints: immediate
Shoulder: eight weeks.

Etiological varieties of fracture neck

(1) DIRECT CONTUSION CRACK FRACTURES
Etio: Direct trauma
Treat: No immobilization
: Sling and early exercises

(2) ADDUCTION FRACTURES: (anatomical neck).
Etio: Fall on outstretched arm
Children
Site: Anatomical neck: (See above)
Clinic: (1) Shaft adducted and impacted
(2) Articular effusion
Compl: Adhesions
Treat: (A) Elderly: Immediate exercises and sling
(B) Young:
(1) Reduction: By traction+abduction
↓ (2) Fixation:
By: Abduction frame
In: Abduction arm
For: Four weeks.

(III) **Physiotherapy and movements:**
- (A) Immediate: fingers, wrist, elbow
- (B) Delayed: shoulder
- (C) **Deltoid massage**

(B) SHAFT OF THE HUMERUS:

Etio: Direct, indirect, muscular trauma

Varieties:
- (1) Transverse: (a) Direct trauma
  - (b) Angular strain
- (2) Oblique: angular strain
- (3) Spiral: rotational strain

Sites: (1) **Subcervical:** Above the pectoral insertion

Path: Upper fragment: abducted
Lower fragment: adducted

(2) **Upper third:** Above the deltoid insertion

Path: Upper fragment: adducted
Lower fragment. abducted and up

(3) **Middle third:** Musculo-spiral groove
Path: Upper fragment. abducted
Lower fragment: adducted and up.

(4) **Lower third:**
Path: Upper fragment. anterior and down
Lower fragment: posterior and up.

Clinic:
- (1) History of trauma and loss of function
- (2) **Shortened arm**
- (3) Local broadening
  - (a) Lateral
  - (b) Antero-posterior
- (4) Angulation
- (5) **Abnormal mobility**
- (6) Crepitus

Compl:
- (1) **Injury to the musculo-spiral nerve**
- (2) **Non-union**
- (3) **Myositis ossificans**

Treatment of fracture shaft of the humerus

(1) *General Principles:*

(I) **Reduction:**

by:
- (a) **Manipulations**
- (b) **Traction:** (α) Splints
  - (β) Olecranon pin
- (c) **Operation:**
  - Ind: (α) Radial injury
  - (β) Soft tissue intervention
  - (γ) Failed traction

(II) **Fixation:**

in: (a) **Arm: adducted**
Elbow: flexed
Forearm: supinated

(*b*) **Arm : abducted and flexed**
Elbow : flexed
Forearm : supinated

by : (1) **Adduction apparatus :**
(*a*) Robert Jones splint
(*b*) Crutch Y splint
(*c*) Plaster of Paris

(2) **Abduction apparatus :**
(*a*) Bohler abduction splint
(*b*) Aeroplane splint
(*c*) Thomas' arm splint

With : Traction or no traction
For : **Three weeks**

(III) **Physiotherapy and movements**

(2) *Special fractures :*

(A) **Spiral fractures :**

(1) Fixation
By : **plaster slab + sling**
Extent : axilla → elbow → shoulder
For : Five weeks

(2) Physiotherapy and active exercises :
(*a*) Immediate : fingers and wrist
(*b*) After five weeks elbow and shoulder

(B) **Horizontal fracture**

(1) Fixation .
By : (*a*) **Plaster slab**
(*b*) **Abduction frame**
In : **abduction 60°+forward flexion 40°**
For : **six to eight weeks**

(C) **Delayed union fractures :**

(1) **Fixation :**
By : Plaster spica
Extent : Shoulder and elbow included
For : **Five to six months** (X-Ray evidence of union)

(2) **Finger exercises**

(D) **Non-union fractures:**

Bone graft operation

(E) **Radial nerve palsy :**

(1) **Fixation :**
By : Plaster slab
In : Wrist : dorsiflexed
Metacarpo-phalanges : extended

(2) **Exploration and neurolysis :**

Ind : No signs of recovery at the end of

(C) LOWER END OF THE HUMERUS:

(1) SUPRACONDYLAR TRANVERSE:

Etio: **Falls on hand**

Path: (A) **Common type:** Displacement:
- Upper fragment: forwards and down
- Lower fragment: backwards and up
- Fracture: oblique from behind forwards and down

(B) **Reverse type:** Reverse is the displacement and fracture line

Clinic:
1. **Normal bony points of the elbow joint**
2. **Shortened arm:** acromion to external condyle
3. Swelling above the elbow: with **anteroposterior broadening**
4. Crepitus

Compl:
1. **Limitation of flexion and extension**
2. Cubitus valgus or varus

Treat:
1. **Reduction**. By manipulations (of the common type)
   - (a) Traction
   - (b) Local pressure
   - (c) Flexion of the elbow.
2. **Fixation:**
   - In: Elbow. flexed 45°
     - Forearm: supine
     - Hand: placed on opposite shoulder
   - By: Posterior plaster slab and collar cuff
   - For: Three weeks

N.B.—In the other variety, the fracture is reduced by traction and extension of the elbow and is immobilised in extension.

After-treat:
1. **Exercises:**
   - (a) Immediate: fingers and shoulder
   - (b) After three weeks: elbow
2. **Check X-Ray film:** After one week

(2) TRANS-CONDYLAR OR DICONDYLAR:

Site: At the level of epicondyles
Involving olecranon fossa

Compl: Limitation of movements

Treat: Manipulative reduction

(3) T OR Y FRACTURE:

Etio: Direct injury in adults

Treat: (A) **Reduction: by manipulations**
1. Manipulations:
   - (a) Traction on fully extended elbow
   - ↓ (b) Local lateral manipulations

(2) **Fixation:**
In: elbow extension
By: plaster of Paris
For: four weeks

(B) **Skeletal pin traction:**
Through: olecranon
With: elbow flexed to right angle

(C) **Excision arthroplasty:**
Ind: (*a*) Patient over 40
(*b*) Much comminution
(*c*) Failure of other methods
Tech. (1) Operation: excision + arthroplasty
↓ (2) Fixation:
In: elbow flexed
By: plaster slab + collar cuff
For: four weeks
Sequela: (*a*) **Ankylosis**
(*b*) Deformity

(4) EXTERNAL CONDYLE:

Etio: **Age between 5 and 15**
Path: (1) Extent:
(*a*) External condyle
(*b*) External condyle + capitellum
(*c*) Condyle + capitellum + part of trochlea
(*d*) Part of metaphysis with extensor origin
(2) Displacement
(*a*) Lateral
(*b*) Rotational
Clinic: (1) Articular effusion with free movements
(2) No crepitus
(3) **Disturbed bony point relations**
Diff. diag: **Sprain** of the elbow
Compl: (1) Non-union
(2) **Ankylosis elbow**
(3) **Cubitus valgus**
(4) **Tardy ulnar palsy**
Treat: (1) **Manipulative reduction:**
(A) Manipulations:
(*a*) Gradual elbow flexion
(*b*) Lateral compression
(B) **Fixation:**
In: elbow flexion
By: plaster slab with collar cuff
For: three weeks
(2) **Operative reduction:**
Ind: Failure of manipulations

Tech: (1) Exposure: lateral curved incision
↓ (2) Open reduction
↓ (3) Fixation: by suture or pinning

(5) INTERNAL CONDYLE:

(A) Extra capsular

(B) Intra capsular

(6) SEPARATION OF LOWER HUMERAL EPIPHYSIS:

Etio: **Age upto 18**
Causes: Falls on elbow
Dislocation elbow

Path: Joint involvement

Clinic: (1) History of injury
(2) Effusion into the joint
(3) ***Abnormal bony point relations***

Varieties:

(A) Metaphysis:

Clinic: (1) Signs of synovitis
(2) X-Rays. (a) Lateral view of affected joint
(b) Lateral view of normal joint

Treat: (1) Manipulative reduction
↓ (2) Fixation.
In: full extension
By: plaster slab
For: three weeks

(B) External condyle: (See above)

(C) Epicondyles:

(1) External:

(2) Internal

Etio: Valgus strain
↓ Traction of common flexor origin
Age: between 7 and 17

Path: Displacement degrees
(a) Minimal simple displacement
(b) Marked simple displacement
+ rupture int. lateral ligament
(c) Avulsion
+ Rupture ligament
+ Interposing displacement
(d) Avulsion
+ Outward dislocation

Clinic: X-Ray absence of ossification centre

Compl: Tardy ulnar paralysis

Treat: (A) Simple:
(a) Rest: in flexion by collar cuff
↓ (b) Active exercises

(B) Interposing epicondyle
(1) Manipulative reduction:
Supination and extension
↓ Flexion just above rt. angle
↓ Fixation by collar cuff.
(2) Operative reduction:
Tech: (a) Reduction
↓ (b) Catgut fixation
↓ (c) Anterior ulnar transposition

(D) Capitellum: Alone or in association with external condyle.
(See above & below)

(E) Trochlea·

(7) CAPITELLUM·
Varieties: (A) Bruising of capitellar articular cartilage
Etio: Fracture radial head
Clinic: Limited extension with joint effusion
Compl· (1) Avascular necrosis
(2) Osteochondritis dissecans.

(B) Chip fracture of articular cartilage:
Etio: Fracture radial head
Clinic: (1) Limited extension with joint effusion
(2) X-Ray: negative
Treat. Excision

(C) **Fracture front half of the capitellum:**
Etio: **Fracture radial head**
Clinic· (1) Limited extension with joint effusion
(2) **X-Ray: lateral view**
Treat (1) **Manipulative Reduction:**
(a) Manipulations:
extension
+ traction
+ direct pressure
(b) Immobilization:
In: Acute flexion
or extension
By: Plaster slab
For: Four weeks
(2) **Operative reduction:**
Ind: Failed manipulations
(3) **Excision:**
Ind: Old unreduced fracture

Complications of fracture lower end of humerus

(1) **NERVES:** Ulnar, Median, Radial
(a) **Immediate:** Traumatic
(b) **Intermediate:** Callus implication
(c) **Delayed:** Irritation neuritis

(2) MUSCLES:

(a) **Myositis ossificans**

(b) **Volkmann's myositis fibrosa**

(3) JOINT:

(a) **Ankylosis:**

(α) Adhesions

(β) Callus

(γ) Myositis ossificans

(b) **Osteoarthritis**

(c) **Septic arthritis**

(4) ABNORMAL GROWTH WITH DEFORMITY:

Malunited epiphysis

(5) MAL-UNION:

Treat: (A) **Upto three weeks:**

. Manipulations

(B) **Beyond three weeks:**

: (1) Immediate operative reduction

(2) Late osteotomy ·

Ind · (a) Ankylosis

(b) Cubitus valgus or varus

General principles of the treatment of fracture lower end of the humerus:

(I) REDUCTION:

By: (A) **Manipulations:**

Traction

↓ **Local pressure**

↓ **Flexion elbow**

(B) **Traction: Olecranon pin** with elbow at right angle

(C) **Operation:**

Ind: (a) Failure of conservatism

(b) Separation of condyle or epicondyle

(c) Intra-articular comminution

(d) Epiphysial separation

(II) FIXATION:

In: (A) **Extension fracture:**

Elbow: flexed to 45°

Forearm: supinated

Hand: on opposite shoulder

Carrying angle maintained

(B) **Flexion fractures:**

Elbow: extended

By: (1) A sling

(2) Bandage

(3) **Posterior plaster slab with collar and cuff**

For: Three weeks

After-treat: Active exercises:

(a) Immediate: fingers, shoulder

(b) After 3 weeks: elbow

(8) RADIUS:

(1) UPPER EXTREMITY OF THE RADIUS:

Etio: Direct trauma
Dislocation elbow

(A) HEAD OF RADIUS:

Varieties: (1) **Crack fractures:** With no displacement

Treat: (a) **Sling** for elbow:
In: flexion
For: two weeks

(b) Exercises: fingers, shoulder, elbow

(2) **Marginal fractures:** With displacement

Treat: **Excision** of the radial head

(3) **Comminuted fractures:**

Treat: **Excision** of the radial head:
Time. Within first week
Tech. Whole head
Compl. Shortening of radius
↓ Radial deviation of hand

(B) NECK OF RADIUS:

Path: Displacement: lower fragment: forwards and upwards

Clinic: (1) Joint effusion
(2) **Painful supination**
(3) Local tenderness
(4) **Head not moving with the shaft**

Treat: (1) Reduction:
(a) Manipulations
(b) Open operation: excision of head

(2) **Fixation:**
In: Elbow: flexed
Forearm: supine
By: (a) Bandage
(b) **Posterior plaster cast**
(c) Sling

(3) Physiotherapy and movements

(C) SEPARATION OF UPPER RADIAL EPIPHYSIS:

Etio: Fall on the outstretched hand
Age: child

Treat: (1) **Manipulative reduction:**
(a) Manipulations: extension
↓ adduction
↓ local pressure
(b) Fixation:
In: Elbow: at right angles
By: Posterior plaster cast
For: Three weeks
(2) **Operative: Reduction**
(a) Open operation
↓ (b) **Fixation:**
In: Elbow: at right angles
By: Plaster cast
Extent: Shoulder to metacarpal heads
For: Three weeks

(2) SHAFT OF THE RADIUS:

Etio: **Falls on outstretched hand**

(A) GREENSTICK AND CRACK FRACTURES:

Etio: **Children**
Clinic: (a) **Local tenderness**
(b) *Bending deformity*
Treat: Fixation
In: Elbow at right angles
Forearm. supine or midway
By. Plaster of Paris
Extent: Metacarpus to lower arm
For: Six weeks

(B) SUPRA-PRONATOR FRACTURE:

Path: Displacement: Upper fragment: full supination
Lower fragment: full pronation
Angulation towards ulna.

(C) INFRA-PRONATOR FRACTURE:

Path: Displacement. Upper fragment: midway
Lower fragment. full pronation
Angulation towards ulna
Clinic. of (B) and (C)
(1) History of fall on outstretched hand
(2) Local tenderness and deformity
(3) **Painful and deficient pronation and supination**
Treat: (1) **Reduction:**
(A) **Manipulative**
(B) ***Operative:*** *Bone peg*
Ind: (a) Persistent angulation
(b) Persistent overlapping
(c) Cross union

(2) **Fixation:**

In: Elbow: flexion to right angle
Forearm:
(*a*) **Fracture upper third: full supination**
(*b*) **Fracture lower two-thirds: midway**

By: (1) Posterior angular splint
or (2) Internal arm + posterior forearm right angled splint
or (3) **Plaster cast**

Extent: Lower arm to metacarpal heads
For: Three weeks

(3) Physiotherapy and active exercises:
(*a*) Thumb and fingers: immediate
(*b*) Wrist and elbow: end of first week
(*c*) Pronation and supination. end of three weeks

(3) LOWER EXTREMITY OF THE RADIUS:

Etio: (1) **Falls on outstretched hand**
(2) Back fire of chauffeur

within three
ension of the

(B) COLLES' FRACTURE

Def: Fracture of the lower end of the radius, within half an inch to an inch from the wrist joint accompanied by. (*a*) Rupture of the internal lig.
or (*b*) Avulsion of ulnar styloid

Etio: (*a*) **Old ladies**
(*b*) Trivial injury. fall with:
hand: abducted
wrist: extended
forearm: pronated
elbow: flexed

Path: Displacement: lower fragment: backwards
outwards
upwards
rotated outwards

Clinic: (1) Elderly ladies with history of **fall on hand**
(2) **Deformity:** (*a*) Radial deviation of hand
(*b*) Dinner fork deformity
(3) **Radial styloid: on level with or above the level of ulnar styloid**

Treat: (1) **Reduction:** By manipulations
(*a*) **Disimpaction**
(*b*) **Traction** with counter-traction

(c) **Local manœuvres**
  (α) **Shake hand method**
  (β) Palm torsion method
  (γ) Local pressure method

(2) **Fixation:**
In: (a) **Forearm: Pronated**
 + (b) **Wrist:**
   (α) **Extended**
  or (β) **Straight**
 or (a) Forearm: supine
 + (b) Wrist: flexed
   Ind: Recurring displacement
By. (a) **Carr's cock-up splint:** (extension)
 (b) Todd's splint. (flexion)
 (c) **Plaster cast:** (any position)
Extent: **Just below elbow to metacarpal head**
For: **Five weeks**

(3) **Physiotherapy:**
 (A) **Splint method:**
  (a) Fingers, elbow, shoulder: immediat
  (b) Wrist:
   (α) Flexion and extension
     end of one week
   (β) Adduction and abduction.
     end of two weeks
   (γ) Pronation and supination:
     end of three weeks
 (B) **Bohler's plaster method**
  (a) Fingers, shoulder, pronation an
    supination: immediate
  (b) Wrist: end of 3 to 5 weeks
    (removal of plaster cast)

Compl: (1) Valgus deformity with **mal-union:**
 Treat: (a) Upto three weeks: manipulation.
  (b) Three to eight weeks: Thomas' wrench
  (c) After eight weeks. osteotomy
(2) Adhesions of flexor **tendon sheaths**
(3) Rupture extensor long. pollicis tendon
 : during second month
(4) Stretching of or hæmorrhage in **median nerve**
(5) **Osteoarthritis** of the wrist
(6) **Traumatic osteoporosis** of carpals (Sudeck)
 Cause: Hyperæmia
 Clinic: Weakness, pain, trophic changes
  X-Rays: decalcification

Diff. diag : (*a*) **T.B. wrist**
(*b*) **Osteoarthritis wrist**
Treat : Plaster cast
Periarterial sympathectomy
(7) Weak wrist

(C) SMITH'S FRACTURE: Reversed colles'
• Etio: Fall on: Hand: abducted
Wrist : flexed
Forearm : supinated
Elbow : flexed
Path: Displacement: lower fragment. forwards & outwards

(D) SEPARATION OF LOWER RADIAL EPIPHYSIS with avulsion of metaphysial margin : (Juxta-epiphysial fracture)
Etio: **Age: 2 to 20**
Clinic : **Colles' fracture in children**
Compl : (1) Fracture ulna ·
(*a*) Avulsion of ulnar styloid
(*b*) Separation ulnar epiphysis
(*c*) Greenstick fracture of ulna
(2) Ulnar nerve paralysis
: Due to displacement of radial shaft
Treat · As in Colles' fracture
Sequela . Crushing of lower radial epiphysis
↓ Premature epiphysial union and arrested growth
Etio · Falls on hand dorsiflexed to right angle
Clinic: (1) Manus valgus
(2) Unequal lengths of ulna and radius
Treat: (1) Epiphyseodesis of ulna: excision
(2) Subperiosteal excision of lower end of ulna
↓ Immobilization ·
By: Plaster of Paris
For Four weeks

(E) RADIAL STYLOID FRACTURE:
(1) Compression fracture.
Etio: (*a*) Back fire
(*b*) Fall on outstretched hand
↓ Impact against the scaphoid
Treat. (1) Reduction: by lateral compression
↓ Fixation:
By: Plaster of Paris
For: Five weeks
(2) Avulsion fracture:
Etio: Inward dislocation of the wrist
↓ Traction on external lateral ligament
Treat: (1) Reduction: traction → manipulations
↓ (2) Fixation:
By: Plaster
For: Five weeks

Site: **Junction of middle and lower third**
Treat.: Tibial bone graft
↓ *Complete immobilization*

(4) STYLOID PROCESS:

Etio: **Colles' fracture**
Treat: (1) As in Colles' fracture
+ (2) Fixation in adduction of the hand

(A) FRACTURES OF RADIUS AND ULNA:

Etio: (1) Direct trauma: same level
(2) Indirect trauma: (*a*) Radius upper third
+ Ulna lower third
(*b*) Radius lower third
+ Ulna middle third

Clinic: (1) Shortened forearm
(2) Angular **deformity**
(3) Crepitus

Compl: **Cross union:**
Clinic: Loss of pronation and supination

Treat: (1) **Reduction**: by
(1) **Manipulations**: After strong sustained *traction with counter-traction*
(2) **Traction**
(3) **Open operation**

(2) **Fixation:**
In: Elbow: at right angles
Forearm: full supination
By: (1) **Posterior splint**
(2) **Plaster cast:**
From metacarpal head to shoulder
(3) **Operation:**
(*a*) Impaction
(*b*) Intramedullary peg
(*c*) Plating
For: Ten weeks

(3) **After-treat:**
(*a*) Check X-Ray films
(*b*) Changes in plaster
(*c*) Finger and shoulder exercises

Indications for operative treatment of both the forearm bones

(1) **Persistent displacement:**
Treat: Open reduction: with or without internal fixation

(2) **Fractures at the same level**

(3) **Cross union:**
Etio: (1) Fracture of both the bones with **mal-union**

(2) **Post-operative:** failure of periosteal suture
↓ Ossification of hæmatoma

Clinic: **Loss of pronation and supination**

Treat: **Operation:**
(a) Refracture and restoration of radius
\+ (b) Interposition of muscle

After-treat: Fixation:
In: { Elbow: right angles; Forearm: mid-position; Wrist: straight }
By: Plaster of Paris
Extent: Shoulder to metacarpus
For: Eight weeks

(B) FRACTURE ULNA WITH DISLOCATION OF RADIAL HEAD:

Varieties: (1) Forward: Angulation and dislocation
(2) Backward: Angulation and dislocation

Treat: (1) Forward:
(a) Manipulative reduction:
: Traction → flexion to right angle → backward pressure
↓ (b) Fixation:
In: Elbow at right angles
By: *Plaster*
Extent: Shoulder to metacarpus
For: Three weeks
(2) Backward.
(a) Manipulative reduction:
: Traction → extension → forward pressure
↓ (b) Fixation
In: Elbow extension
Rest as in (1) above

(C) *FRACTURE RADIAL SHAFT WITH INFERIOR RADIO-ULNAR DISLOCATION:*

Path: (1) Fracture Radius:
(a) Junction of middle and lower third
(b) Inward angulation
\+ (2) Rupture of inferior radio-ulnar joint ligaments

Treat: (1) Manipulative reduction:
(a) Traction from the thumb:
With: Elbow: at right angles
Forearm: midway
Wrist: adducted
(b) Counter traction at the elbow
(2) Fixation:
In: Elbow: at right angles
Forearm. midway
Wrist: adducted

By : Plaster of Paris
Extent. Upper arm to metacarpal heads
For. Ten weeks
After-treat. (1) Finger and shoulder exercises
(2) Check X-Rays
Compl. (1) Recurrent angulation :
Treat : (a) Continuous thumb traction
(b) Skeletal transfixion
(c) Internal fixation
↓ Immobilization for three months
(2) Non-union.

(10) CARPAL SCAPHOID or NAVICULAR :

Etio : Sprained wrist with **fall on hand**
Sites : (1) Tubercle
(2) Proximal pole
(3) Waist
(4) *Fracture dislocation*
(A) **Primary diagnosis :**
Clinic (1) **Signs of wrist sprain**
(2) Fullness and tenderness in anatomical snuff-box
(3) Pain on percussion over the thumb tip
(B) **Secondary diagnosis :**
Persistent 'sprain' of the wrist
Diagnosis. X-Ray (a) Antero-posterior
(b) Lateral
(c) Oblique
(d) **Delayed**
In extreme ulnar deviation of hand
Compl. (1) **Non-union**
(2) **Post-traumatic avascular necrosis**
(3) **Osteoarthritis wrist**
(4) **Kienboch's post-traumatic dystrophy**
(5) **Weak wrist**
Treat : (A) **Recent fracture :**
(1) **Reduction : By manipulations :**
Flexion and extension
↓ (2) ***Fixation :***
In : Wrist hyper extended (40°) an abducted
By. (a) Cock-up splint
(b) **Plaster cast :** Posterior o *complete*
Extent : Metacarpal head to below th elbow
For : Twelve weeks :
or X-Ray evidence of complete union
(3) **After-treat : leather support for six months**

(B) **Old complicated fracture:**

Operative treatment

Ind: (1) Non-union
(2) Avascular necrosis
(3) Arthritis wrist

(1) Fracture scaphoid with delayed union:
Treat: Uninterrupted, prolonged, Complete fixation of the wrist

(2) Fracture scaphoid with non-union:
Treat: (*a*) Multiple drillings
(*b*) Bone graft

(3) Fracture scaphoid with avascular necrosis:
Treat: Excision of (*a*) Dead bone only
(*b*) Whole bone
Time. Within a few weeks
Incision: Radial side of ext. poll. long.

(4) *Fracture scaphoid with Arthritis wrist:*
Treat: Arthrodesis of wrist
In: 20° dorsiflexion
By: (*a*) Excision of radiocarpal and midcarpal cartilages
(*b*) Bone graft
After-treat. Fixation for twelve weeks

(11) METACARPALS:

Etio: (1) Direct trauma
(2) Indirect trauma: punching
Sites: (1) Base of the first
(2) Neck of the fifth

(A) FRACTURES AT THE BASES OF THE METACARPALS:

(1) **Fracture dislocation of the first metacarpal: · Bennett's fracture**

Etio: Boxers
Falls on outstretched hand
Path: Displacement. shaft back and up (**'stave'**)
Treat: (1) Reduction:
(*a*) Manipulative
(*b*) Traction on extended and slightly abducted thumb
(2) Fixation:
In: (*a*) Flexion: slight displacement
(*b*) **Extension**: marked displacement
By: (*1*) *Bandage on a ball*
(2) Verrall's splint
(3) Wire circle splint
(4) **Pulp pin extension: 4 weeks**

(5) ***Plaster cast + wire finger splint***
Extent: forearm, dorsum of the hand and thumb upto base of the first phalanx

Compl: Painful ankylosis

(2) ***Simple fracture of the base of the 1st metacarpal:***

Path: Displacement: angulation out and back

Treat: (1) Reduction: by traction and manipulations
↓ (2) Fixation:
In Metacarpo-phalangeal joint extended and abducted
By: Plaster cast
Extent: From forearm to metacarpal heads
For: Four weeks
(3) *Finger exercises*

(B) FRACTURES OF THE SHAFTS OF THE METACARPALS:

(1) **Spiral:**

Etio: Falls on ulnar border

Sites: Third, fourth and fifth metacarpals

Treat: (1) Reduction by manipulations
↓ (2) Fixation: by **dorsal plaster cast for four weeks**

(2) **Transverse:**

Etio: Direct trauma

Sites: First and fifth

Treat: (1) Reduction: by traction
↓ (2) Fixation: by dorsal plaster cast for four weeks

Compl: Non-union

(3) **Punch: Fracture shaft of the second metacarpal**

(C) FRACTURES AT THE NECKS OF THE METACARPALS:

Treat: (1) Reduction: by manipulations
(*a*) Flexion of metacarpo-phalangeal joint to right angle
(*b*) Pressure backwards in the long axis of the phalanx
(2) **Fixation:**
In: Finger flexed
By: Dorsal plaster cast
Extent: Upper forearm to tip of the finger
For: Three weeks
(3) Finger exercises

(12) PHALANGES:

Principles in the treatment of finger injuries:

(1) Injured finger must be **immobilised in flexion**

(2) Every uninjured finger must be **actively exercised** and never passively stretched

(3) Every fracture of a phalanx must be **carefully reduced and fixed**

(4) **Compound finger injuries must be immediately operated**

- (a) No suture of cut tendons
- (b) No catgut to be used
- (c) Early amputation of markedly crushed and infected finger
- (d) Thumb must not be amputated

Fracture of proximal phalanges:

Treat: (1) **Reduction:** By manipulations under local anæsthesia

↓ (2) **Kirschner's wire** through the pulp

↓ (3) **Plaster slab:** Metacarpal joint to elbow joint

↓ (4) **Cramer wire** finger splint.

Fingers with: Knucle joint: 45°
Mid joint: 90°
Terminal joint: 45°

↓ (5) **Extension** from Kirschner (2) to Cramer (4)
For: Three weeks

↓ (6) Removal of the plaster after four weeks

+ (7) Finger exercises immediate

(13) THE PELVIS

(A) FALSE PELVIS:

Sites: (1) **Iliac crest**
(2) **Anterior superior iliac spine:** Sartorius
(3) **Anterior inferior iliac spine:** Rect. femoris

Etio: (1) Direct trauma
(2) Avulsion fractures: muscular action

Treat: (1) **Firm flannel bandage**
(2) Bone pegging

(B) TRUE PELVIS:

(1) COMPLETE RING FRACTURES

Etio: Run-overs and crushes

Sites: (A) **Pubic segment:** Bilateral fracture
(B) **Iliac and pubic:** (a) Same side
(b) Opposite sides
(C) **Watson Jones' double division of pelvic ring:**

Fracture with backward & upward dislocation of:
(1) Symphysis pubis
+ (2) Sacro-iliac joint of either side

Clinic: (1) Severe shock with pain in pelvis
(2) **Pain on lateral or antero-posterior pressure** or separation
(3) Shortening of lower limb (in Watson Jones only)
(4) Crepitus
(5) **Rectal examination**
(6) X-Rays: (a) Antero-posterior
(b) Lateral
(c) Oblique

Compl.: (1) Injury to the **urethra**
(2) Injury to the **bladder:**
(a) Intraperitoneal
(b) Extraperitoneal
(3) Injury to the **rectum**

Treat: (1) **Treatment of shock**
(2) **Treatment of visceral injury**
(a) **Pass in a catheter**
(b) **Make a rectal examination**
(A) Rupture urethra:
(1) Suprapubic cystostomy
↓ (2) External urethrotomy
(B) Rupture bladder:
(1) Suprapubic cystostomy
↓ (2) Drainage above and below
(C) Fascial extravasation:
(1) Suprapubic cystostomy
↓ (2) Multiple incisions & drainage
(D) Peritoneal extravasation:
(1) Laparotomy
↓ (2) Peritoneal cleansing
↓ (3) Bladder suture with drainage
(E) Rectal Laceration:
(1) Division of anal canal from anus to the rupture
+ (2) Antiseptic pack
+ (3) Iliac colostomy
(3) **Treatment of Fracture:**
(1) **Reduction:**
By (A) Bimanual manipulations
Watson Jones fracture disl.: { (B) Lateral recumbency under general anæsthesia
(C) Downward and forward pressure on iliac crest }

(2) **Fixation :**
In : Hips extended
By : Plaster cast
Extent : Trunk, pelvis and both the thighs
For : Six to twelve weeks

(3) **Quadriceps and knee exercises**

(2) INCOMPLETE FRACTURES :

(A) **Acetabulum :**

Etio : (1) **Lip** of the acetabulum.
Dorsal dislocation of the hip
(2) **Floor** of the acetabulum :
(*a*) Dislocation of the hip : central
(*b*) Direct trauma : fall on troch.

Clinic : (1) Lip *fracture : easy reduction* and recurrence of dislocation
(2) Floor fracture :
(*a*) Impaction of femoral head
(*b*) **Rectal or vaginal exam.**

Treat : (1) Reduction :
(*a*) Manipulations
(*b*) Traction under anæsthesia
(2) Fixation :
In : Thigh : abducted and extended
By : (*a*) Plaster of Paris :
or (*b*) Weight extension
(α) Indirect
(β) Skeletal
For : Six weeks
(3) After-treat : Walking calliper for 3 to 6 months

(B) **Pubic ramus or symphysis :**

Treat : (1) Bimanual reduction
↓ (2) Recumbency for a few weeks

(C) **Ischial tuberosity :**

(1) **Fracture :**
Etio : Falls on buttocks
Clinic : (1) Inability to sit
(2) Local signs

(2) **Separation of epiphysis :**
Etio : Traction of hamstrings in runners

(D) **Sacrum :**

Etio : (1) Direct trauma
(2) Indirect trauma.

Fracture with backward & upward dislocation of:
(1) Symphysis pubis
+ (2) Sacro-iliac joint of either side

Clinic: (1) Severe shock with pain in pelvis
(2) **Pain on lateral or antero-posterior pressure** or separation
(3) Shortening of lower limb (in Watson Jones only)
(4) Crepitus
(5) **Rectal examination**
(6) X-Rays (*a*) Antero-posterior
(*b*) Lateral
(*c*) Oblique

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(2) Injury to the **bladder**:
(*a*) Intraperitoneal
(*b*) Extraperitoneal
(3) Injury to the **rectum**

Treat: (1) **Treatment of shock**
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(A) Rupture urethra.
(1) Suprapubic cystostomy
↓ (2) External urethrotomy
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(1) Suprapubic cystostomy
↓ (2) Drainage above and below
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(D) Peritoneal extravasation:
(1) Laparotomy
↓ (2) Peritoneal cleansing
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By (A) Bimanual manipulations
Watson Jones fracture disl.: { (B) Lateral recumbency under general anæsthesia
(C) Downward and forward pressure on iliac crest }

(2) **Fixation:**
  In: Hips extended
  By: Plaster cast
  Extent: Trunk, pelvis and both the thighs
  For: Six to twelve weeks

(3) **Quadriceps and knee exercises**

(2) INCOMPLETE FRACTURES:

(A) **Acetabulum:**

Etio: (1) **Lip** of the acetabulum:
  Dorsal dislocation of the hip
 (2) **Floor** of the acetabulum:
  (*a*) Dislocation of the hip: central
  (*b*) Direct trauma: fall on troch.

Clinic: (1) Lip fracture: easy reduction and recurrence of dislocation
 (2) Floor fracture:
  (*a*) Impaction of femoral head
  (*b*) **Rectal or vaginal exam.**

Treat: (1) Reduction:
  (*a*) Manipulations
  (*b*) Traction under anæsthesia
 (2) *Fixation:*
  In: Thigh: abducted and extended
  By: (*a*) Plaster of Paris:
  or (*b*) Weight extension
   (α) Indirect
   (β) Skeletal
  For: Six weeks
 (3) After-treat: Walking calliper for 3 to 6 months

(B) **Pubic ramus or symphysis:**

Treat: (1) Bimanual reduction
 ↓ (2) Recumbency for a few weeks

(C) **Ischial tuberosity:**

(1) **Fracture:**
  Etio: Falls on buttocks
  Clinic: (1) Inability to sit
   (2) Local signs

(2) **Separation of epiphysis:**
  Etio: Traction of hamstrings in **runners**

(D) **Sacrum:**

Etio: (1) Direct trauma
 (2) Indirect trauma

Clinic: (1) Pain in the back
(2) Rectal or vaginal examination. sacral tenderness
Compl: (1) Rectal trauma
(2) ***Sacral neuritis***

(E) **Coccyx:**
Etio: (1) **Parturition**
(2) Kicks
Clinic: Local signs rectal or vaginal examination
Compl. **Coccydynia**
Treat. (1) Reduction via rectum and fixation
(2) Excision

(14) FEMUR

(I) UPPER END:

(A) FRACTURE NECK.

Varieties: (1) **Anatomical**
(a) **Subcapital:** Intracapsular
(b) **Basal:** Extracapsular
(c) **Trochanteric:** (α) Inter
(β) Per

(2) **Etiological:**
(a) ***Abduction:***
: Subcapital impacted with valgus
(b) **Adduction:**
(α) Subcapital with varus
(β) Basal cervical & inter-trochanteric or *extracapsular*
(c) **Contusion** or direct trauma:
(α) Inter-trochanteric
(β) Pertrochanteric of Kocher

(1) **Abduction: Subcapital intracapsular with valgus:**
Synonym: **Latent fracture** of Mouchet
Etio: **Slight abduction strain in old women**
Path: Site: junction of the head with the neck
Displacement: **impaction**
Clinic: (1) Slight eversion and abduction of thigh
(2) **No loss of function**
Compl: (1) **Avascular necrosis** of femoral head
(2) Coxa valga
(3) Degenerative **arthritis** hip
Treat: (1) **Rest in bed for a few weeks with knee exercises**
or (2) Fixation:
By: **Plaster cast**
Extent: Thorax to above the knee
For: Twelve weeks
With: **Early locomotion** and knee exercises

(2) **Adduction fractures of the neck of the femur:**

(A) **Subcapital Intracapsular with varus:**

Etio: **Trivial trauma**

Clinic: (1) **Deformity: Eversion:** 40°–50° }
Shortening: 0.5"-1" } of the lower extremity
Adduction }

(2) **Elevation of greater trochanter:**
: (a) Nelaton's line
(b) Bryant's △
(c) Chiene ||
(d) Shoemaker's lines

(3) Relaxation of iliotibial band

(4) X-Rays

Diff. diag: (1) *Contusion of soft parts*
(2) Dislocation of hip
(3) Osteoarthritis hip

Compl: **Non-union:** (a) Atrophic changes
(b) Avascular necrosis

Treat: (1) **Whitman**
(2) **Smith-Petersen:** Closed method

(B) **Basal cervical and inter-trochanteric or extra-capsular fracture:**

Etio: **Indirect trauma** due to a fall **in younger people**

Path: (a) **Eversion:** (1) More comminution and impaction posteriorly
(2) Gravity

(b) Shortening: **impaction**

Clinic: **All signs of (A) more marked**

Treat. (1) **Whitman**
(2) **Smith-Petersen**

(3) **Contusion fractures of the neck of the femur:**

(A) **Inter-trochanteric:** Clinic and treat, as in (2) B above

(B) **Pertrochanteric fracture of Kocher**

Etio **Direct violence in young people**

Clinic: (1) Local trauma
(2) **Local signs** of fracture
(3) Great trochanter independent of shaft
(4) **X-Rays**

Treat: (1) Nail fixation: **Smith-Petersen**
(2) **Whitman**
(3) Skeletal traction: well-leg-traction

(4) **Separation of Epiphysis of femoral head:**

Etio: Age 18–20

Clinic: Subcapital or **intracapsular fracture before 20**

Treat : (1) As in subcapital fracture
(2) Open reduction

(B) FRACTURE TROCHANTERS:

(1) **Great trochanter:**

Etio: (1) Contusion fracture
(2) Avulsion fracture

Varieties: (1) Primary
(2) Secondary to pertrochanteric
(3) Separation of epiphysis

Clinic: (1) Local signs
(2) Painful eversion
(3) Trochanter independant of the shaft
(4) **X-Rays**

Treat (1) **Fixation:**
In: Thigh: abducted and everted
By. Plaster spica
For: Six weeks
(2) Pegging

(2) **Small trochanter:**

Etio: (1) Contusion fracture
(2) Avulsion fracture: ilio-psoas

Varieties: (1) Primary
(2) Secondary to pertrochanteric
(3) Separation of epiphysis: upto 18

Clinic: (1) Local signs
(2) Painful inability of flexion hip
(3) Trochanter independant of the shaft
(4) **X-Rays: in eversion**

Treat · **Fixation:**
In: Flexion 90° and eversion
By: Plaster spica
For. Six weeks

Prognosis of fractures neck of the femur: Panwel's groups

Angle of the line of the fracture with the horizontal is t[he] most important factor in prognosis and treatment

Group (I) 30°: Good prognosis. Conservative method
Group (II) 30°–50°: Fair prognosis: Smith-Petersen
Group (III) 50°–90°· Bad prognosis: Nailing + pegging

Treatment of fracture neck of the femur:

(1) **Simple sand bag protection:**
Ind: Very **old debilitated** patients

(2) **Thomas's hip splint with patten an[d] crutches**
Ind: Old **debilitated but ambulatory** patien[t]

(3) **Whitman's Abduction Plaster :**

Ind : **Routine** where Smith-Petersen not available or advisable

Tech : (*a*) Anæsthesia : local 2% novocain
(*b*) Disimpaction
(*c*) *Reduction of fracture : by*
(α) Traction with countertraction in **extension**
(β) **Abduction : 40°**
(γ) ***Inversion* : disappearance of small trochanter**
(*d*) **Fixation :**
By : Plaster of Paris spica
Extent : Chest to foot
For : Twelve weeks
(*e*) **Calliper splint for six months**

Disadvantages : (*a*) Long immobilization
(*b*) Stiff knee
(*c*) **Non-union**
(*d*) Pulmonary embolism

(4) **Smith-Petersen :** Three flanged stainless steel nail over a guide

Essentials : (1) *Right length*
(2) Right plane
(3) No loosening
(4) Full and immediate knee exercises
(5) Wire guide with directing apparatus
(6) *Radiographical check in two planes*

Tech : (A) Whitman's closed method
(1) Reduction of the fracture
(2) Immobilization in abduction and slight inversion
(3) Two plane radiographs
(4) *Incision : three inches over trochanter major*
(5) Gouging a hole one-third inch wide in the cortex, half an inch below the lower margin of the trochanter
(6) Wire guide drive
(7) Two plane radiographs or screening
(8) Nail introduction over the guide
(9) Final two plane radiographs
(10) Closure of the wound

(B) Watson Jones' open method
Ind : (*a*) *Young* and healthy
(*b*) Closed reduction impossible
(*c*) Non-union with interposition of soft parts

Treat: (1) As in subcapital fracture
(2) Open reduction

(B) FRACTURE TROCHANTERS:

(1) **Great trochanter:**

Etio: (1) Contusion fracture
(2) Avulsion fracture

Varieties: (1) Primary
(2) Secondary to pertrochanteric
(3) Separation of epiphysis

Clinic: (1) Local signs
(2) Painful eversion
(3) Trochanter independant of the shaft
(4) **X-Rays**

Treat: (1) **Fixation:**
In: Thigh: abducted and everted
By. Plaster spica
For: Six weeks
(2) Pegging

(2) **Small trochanter:**

Etio: (1) Contusion fracture
(2) Avulsion fracture: ilio-psoas

Varieties: (1) Primary
(2) Secondary to pertrochanteric
(3) Separation of epiphysis: upto 18

Clinic: (1) Local signs
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(6) Wire guide drive
(7) Two plane radiographs or screening
(8) Nail introduction over the guide
(9) Final two plane radiographs
(10) Closure of the wound

(B) Watson Jones' open method
Ind : (*a*) Young and healthy
(*b*) Closed reduction impossible
(*c*) Non-union with interposition of soft parts

Tech · (1) Exposure of neck
· Between gluteus medius and tensor fascia
(2) Capsulotomy and exposure of fracture
(3) Drill thrust under direct vision
(4) Introduction of the nail

After-treat. (1) No plaster: Slipper with cross wood
(2) Full knee movements: From next day
(3) Hip joint exercises. Within a few days
(4) Weight bearing:
(a) Low fracture After 2-3 months
(b) High fractures: After radiographic union
(5) Removal of the nail after radiographic union

Post. Compl
(A) Early Inaccurate insertion with refracture
(a) Marginal insertion
(b) Too short insertion
(c) Too long insertion
(d) Inaccurate reduction of fracture
(B) Late. (1) Loosening and extrusion of the nail
(a) Too quick weight bearing
(b) Sepsis
(2) Fracture of the nail.
Too quick weight bearing
(3) Slipping down of the femoral head
· Too quick weight bearing
(C) Sequelæ (1) Avascular necrosis of femoral head
(2) Osteoarthritis hip

(5) **Skeletal traction:** In full abduction

After-treat: No weight bearing for at least ten weeks

COMPLICATIONS OF FRACTURE NECK OF THE FEMUR:

(1) **Non-union: with or without avascular head necrosis**

Clinic. (a) Limping
(b) Trendelenburg sign

Treat:
(A) **Minimal absorption of neck and live head:**
(1) **Drilling and Nailing: Smith-Petersen**
(2) Schanz osteotomy:
Subtrochanteric wedgeshaped abduction osteotomy
(3) Bone grafting: Hey Groves pegging
(4) Magnuson's reconstruction
(a) Refreshen the neck
(b) Hollow out the head
(c) Impact the neck into the head
(d) Transfer the trochanter low down

(5) **Lorenz's bifurcation osteotomy**
: Displacement of the shaft to the head
After subtrochanteric osteotomy
↓ Fixation: In: 30° abduction
By: Unilateral spica
With: Walking calliper
Ambulation: After twenty days

(B) **Maximal neck absorption with dead head**

(6) **Whitman's reconstruction**
(*a*) Removal of femoral head
(*b*) Implantation of neck into acetabulum
(*c*) Transfer of trochanter lower down
↓ (*d*) Plaster fixation for six weeks

(7) **Colonna's reconstruction**
(*a*) Removal of femoral head
(*b*) Implantation of trochanter into the acetabulum
(*c*) Transfer of trochanteric muscles lower down
↓ (*d*) Plaster fixation for four weeks

(2) **Coxa plana or coxa vara:**
Clinic: (*a*) History of fracture neck
(*b*) Limp with short & everted limb
(*c*) Elevation of trochanter
(*d*) Restriction of abduction & inversion
Treat: Subtrochanteric osteotomy

(3) **Shortening of the limb**

(4) **Ankylosis Hip:**
(*a*) Callus formation: trochanteric fractures
(*b*) Adhesions and osteoarthritis

(5) **Osteoarthritis Hip**

(II) SHAFT OF THE FEMUR:

(1) UPPER THIRD: **Subtrochanteric**
Path: Displacement: upper frag: flexion + abduction + eversion
lower frag: posterior + inwards + upwards

(2) MIDDLE THIRD:
Etio. (1) Indirect trauma: oblique fracture; spiral fracture
(2) Direct trauma: transverse fracture
Path: Displacement: upper frag: flexion + abduction + eversion
lower frag: posterior + upwards + eversion

(3) LOWER THIRD: **Supracondylar**
Etio: (1) Direct trauma: transverse
Path: Displacement: lower frag: flexion + eversion

Displacements in fracture shaft of the femur

(1) Lateral
(2) Overlapping
(3) Angulation: posterior, lateral
(4) Torsion: eversion of lower fragment

Treatment of fracture femoral shaft:

(A) GENERAL CONSIDERATIONS:

(1) **Reduction: by** (A) **Traction:** (a) **Fixed**
(b) **Mobile**
(B) **Operation**

(2) **Fixation: by** (A) **Traction**
(B) **Operation**

(1) **Traction:**

(A) **Fixed or Passive:**

Tech: (1) Reduction of fracture by manipulations under anæsthesia

(2) **Fixation: by:**
(a) **Plaster of Paris:** From toes to chest
(b) **Thomas' knee splint:**

Ind: Fracture without displacement of the middle of the femur in young people

(B) **Mobile or Active or Weight traction:**

(1) **Indirect: Traction to the splint to which limb is tied**
(a) **Thomas' knee splint**
(b) **Hodgen**

(2) **Direct: Traction to the limb itself:**
(a) **Superficial:**
(1) **Adhesive strapping** or glue
(2) **Vertical suspension:** Gallows:
Ind. Infants and children
Position: Slight abduction
Buttocks clear off the bed
Time: Four weeks
After-treat: Walking calliper

(b) **Skeletal:**
(1) **Calliper tongs**
(2) **Steinmann's transfixion pin**
(3) **Kirschner's wire**
at: (α) Above the adductor tubercle
(β) Below and behind tibial tubercle

(2) **Splints used in fracture shaft of the femur:**
(A) **Thomas' knee splint:** (a) Simple
(b) With knee piece

(B) **Hodgen's**
(C) **Gallows:** For children
(D) **Mc. Intyre:** Fractures near the knee joint
(E) **Braun's**
(F) **Hey Groves** cradle splint

(3) **Supplementary devices in the treatment of fracture femur**

(A) Multiplying pulleys: exaggerate the force of extension
(B) **Hinged knee frame:** Mobilisation of knee
(C) **Wire frame foot piece:** Prevention of foot drop
(D) Lateral traction: correction of lateral angulation
(E) Posterior pad: keeping up of anterior femoral bowing

Positions of fixation in fracture shaft of the femur:

(A) Lower fragment in alignment with the upper
(B) Correction of lateral displacement: lateral straps
(C) Correction of overlapping: traction
(D) Correction of angulation: abduction of lower fragment
(E) Correction of torsion: inversion of lower fragment
(F) Correction of posterior sagging: posterior pad
(G) **Mobilisation of the knee:** Flexion of the knee with skeletal traction
(H) **Prevention of foot drop:** Right angled foot-piece

OPERATIVE TREATMENT OF FRACTURE SHAFT OF THE FEMUR:

Ind: (1) **Open fractures**
(2) **Complicated fractures**
(3) **Persistent displacement** inspite of efficient traction
(4) Fracture **neck of the femur:** Smith-Petersen
(5) Separation of **trochanters or condyles**
(6) **Non-union or Mal-union**
(7) Adults

Contraind: Sepsis

Operations: (1) **Plating:**

Ind: Transverse fractures: Of the middle of the shaft

(2) **Pegging:**

Ind: Transverse fractures: Near the extremities or of bony processes

(*a*) Fractures of or about the trochanters
(*b*) Fracture neck
(*c*) Subtrochanteric fracture

(3) **Wiring or Bands:**
Ind: Oblique or spiral fractures of the shaft: With the length more than twice the breadth

(4) **Bone graft:**
(*a*) Surface
(*b*) Intramedullary peg
(*c*) Bone nail or peg
Ind: (1) **Transverse fractures:** Of the shaft
(2) **Non-union**
(3) (See under 'Pegging')

(5) **Step-cut or impaction after freshening:**
Ind: (1) Non-union
(2) Mal-union

Post-oper. compl: (1) Post-operative **shock**
(2) **Sepsis**
(3) Quadriceps **fibrosis**

General after-treatment of fracture of shaft of the femur:

(1) **Traction or immobilisation:**
: For **eight weeks** (until pain and tenderness disappear)

↓ (2) **Immobilisation with walking calliper:**
(*a*) **No weight bearing: eight weeks**
↓ (*b*) **Gradual weight bearing: sixteen weeks**

+ (3) **Exercises** of knee and ankle joints

No full weight bearing should be allowed in fractures of femur till X-Ray shows good bony union

(B) TREATMENT OF INDIVIDUAL FRACTURES OF FEMORAL SHAFT:

(1) SUBTROCHANTERIC:

Immobilisation:

(A) **In: Abduction of 45°**
By: (1) **Plaster spica:** Adduction fractures
(2) **Robert Jones abduction frame:**
With traction for eight weeks
Ind: abduction fractures

(B) **In: Abduction 45° + flexion 60°**
By: Well-leg-traction of Anderson:

Tech. (*a*) Normal limb:
(α) Plaster from sole to upper thigh
(β) Incorporation of apparatus
(*b*) Injured limb:
(α) Plaster from sole to upper calf
(β) Pin one inch above the ankle

Traction: With normal limb pushed up, injured limb pulled down
For: Twelve weeks
After-treat: (a) Immediate: quadriceps & toe exercises
(b) 12 weeks: removal of splint
knee exercises
(c) 16 weeks: weight bearing
Compl: (1) Stiff knee
(2) Dislocation of sound femoral head

(2) FEMORAL SHAFT:

(A) Thomas' bed knee splint with skin extension:

Tech. (1) Local anæsth. 20 c.cs. of 2% novocain
(2) Adhesive strips ankle to mid-thigh
(3) Encircling non-adhesive bandage
(4) Thomas' splint with sling
(5) Prevent (a) obliteration of anterior bowing
(b) hyper extension of knee
(c) eversion of the limb
(d) drop-foot
(6) Fasten the splint to raised foot of the bed
(7) After treat: (a) Toe and foot exercises:
. immediate
(b) Thigh muscle exercises:
: 3 weeks after
(c) Walking calliper splint:
Ind: Clinical union of fracture
Upto. Radiographic consolidation

Compl: Of Thomas' splint
(a) Pressure sore
(b) Stiff knee:
Treat: (α) Fixation in slight flexion
(β) Quadriceps exercise from third week
(γ) Active joint exercises
(δ) Firm bandaging of knee and leg on weight bearing

(B) Braun's splint with skeletal traction:
(1) Instrument: Pin or Kirschner's wire
(2) Site: Tibial tubercle
(3) Weight: 12 to 20 lbs.

(C) Anderson's ambulatory method:
With multiple transfixion pins incorporated in plaster

(3) SUPRA-CONDYLAR FRACTURE:

Fixation
In: Knee flexion 45°
By:

(A) **Thomas' splint angulated: with skin extension**

(B) **Braun's splint: with skeletal traction**

Tech: (1) Angle of the splint behind the supra-condylar region
(2) Tibial tubercle transfixion pin with stirrup
(3) Weight: twenty → ten pounds
(4) Raise the foot of the bed
(5) Weight extension from the sole
(6) Exercises:
(*a*) Toe, ankle and quadriceps. immediate
(*b*) Knee joint: after 10 weeks
(*c*) Weight bearing after 12 weeks

Complications of the fractures of the femoral shaft

(1) **Mal-union:**

(A) **Angulation**

Treat: (1) Osteotomy
↓ (2) Fixation in Thomas' splint

(B) **Shortening**

Treat: (1) Simple osteotomy of the callus
↓ (2) Freshening of the surfaces
↓ (3) Tibial transfixion extension

(2) **Non-union:**

Treat: (1) Exposure
↓ (2) Drilling and freshening
↓ (3) Bone graft
↓ (4) Plaster spica immobilisation

(III) LOWER END OF THE FEMUR:

(1) SEPARATION OF CONDYLES.

Internal or external

Etio: (1) Falls on the knee. **Contusion**
(2) Lateral bending of the knee: **Avulsion**

Clinic: (1) Joint effusion
(2) Local signs of fracture

Compl: (1) Deformity: genu varum or valgum
(2) Ankylosis: knee

Treat: (1) Conservative: (See below)
(2) Open reduction:

(2) T OR Y FRACTURES:

Etio: Falls on feet or knee

Clinic: (1) Joint effusion
(2) Local signs
(3) Broadened knee joint

Treat: (1) Conservative: (See below)
(2) Open operation

(3) SEPARATION OF LOWER FEMORAL EPIPHYSIS:

Etio: **Age: 20-24 years**
Cause: Forcible hyperextension
Path: Metaphysial fracture
∴ Displacement: Upper frag: backwards
Lower frag: flexed
Clinic: (1) History
(2) Age
(3) Joint effusion
Compl: (1) **Gangrene foot**
(2) **Ischæmic contracture** of calf muscles
Treat: **Conservative**: (For fractures lower femoral end)
(1) ***Reduction:***
By: Manipulations under anæsthesia
With: Knee flexed to right angle
↓ (2) **Fixation:**
In: Knee: flexed to 90°: for 4 weeks
↓ flexed to 45°: for 4 weeks
By: (a) Bandage
(b) Anterior plaster shell
(3) **After-treatment:**
(a) Knee exercises: after 3 weeks
(b) Walking calliper: for 6 months

(15) PATELLA

(1) DIRECT: SUBCAPSULAR: **Contusion**

Etio: Direct trauma
Path: Varieties:
(a) Stellate
(b) Marginal
(c) Chip
Displacement: nil
Clinic: (1) Local signs of trauma and fracture
(2) Joint effusion
Treat: (1) Fixation:
By: (a) Posterior plaster slab
(b) Back splint with foot-piece
For: 3 weeks
↓ (2) Ambulatory plaster cast + Unna's dressings to leg
Extent: Ankle to hip
For: 4 weeks
↓ (3) Knee cage: for 6 months
Compl: (1) Too much joint effusion: aspirate
(2) Comminution: excise the patella

(2) INDIRECT: TRANSCAPSULAR: **Avulsion**

Etio: Sudden **quadriceps contraction** to regain the lost balance

Path: (a) Transverse at the junction of middle and lower third
(b) **Aponeurosis torn and interposing**
(c) **Wide separation**

Clinic: (1) History of the accident
(2) Painful loss of knee extension
(3) Joint effusion
(4) **Palpable gap** between the fragments

Compl: (1) **Non-union**
(2) **Fibrous union**: Loss of extension
(3) Ankylosis

Treat: Open operation:

(1) **Primary operation: Five to six days after the trauma**
Local treatment + lavage of the joint

(A) Wiring: (a) Circumferential
(b) Vertical

(B) **Suturing**: (a) Aponeurosis
(b) Fragments: (γ) Circumferential
(β) Vertical

By: (1) Silk
(2) **Chromic catgut no. 6**
(3) Kangaroo tendon
(4) **Fascia lata**

(C) **Fascia lata encirclement:**
With immediate movements

(D) ***Excision: with suture of the aponeurosis: Brooke***

Tech: (1) Median longitudinal or curved transverse incision
(2) Lavage of the joint
(3) Removal of both the fragments
(4) Silk or fascial suture of the aponeurosis

After-treat: (a) Firm bandage with no splint
(b) Removal of dressings and stitches after 10 days
(c) Walking after 15 days
(d) Normal work after six weeks

After-treatment: of operative treatment of fracture patella

(1) **Quadriceps massage: immediate**
(2) **Guarded active flexion: two weeks**
(3) **Normal function: two months**
(4) **Knee cage: six months**

(2) **Secondary operation : Two stage operation**

Ind : Fibrous union with separation

(A) 1st stage : Separation of and traction on the upper fragment and quadriceps

(B) 2nd stage : Suturing or excision of the fragments

Complications : of operative treatment of fracture patella

(1) Sepsis of the joint
(2) Ankylosis
(3) Non-union
(4) Fibrous union
(5) Osteoarthritis

(16) TIBIA

Upper extremity :

(A) **Tuberosities : (*a*) Outer ; (*b*) Inner**

Etio : (1) Direct : **contusion fracture**

(2) Indirect : valgus strain : **avulsion fracture**

Path : (1) Depressed fractures with fracture fibular neck

(2) Comminuted fracture with complete rupture of ligaments

Treat : (1) Correction of valgus and depression of tuberosities

(2) Plaster immobilisation

(3) Quadriceps drill . immediate and prolonged

(1) Depressed Fracture

(*a*) Manipulative reduction :

strong traction

↓ full extension

↓ adduction

↓ lateral or ant-post. compression

(*b*) Fixation :

In · Knee extended

By : Unpadded plaster cast

Extent : Toes to groin

For : 10 weeks

(*c*) After-treatment :

(1) Quadriceps drill : immediate
(2) Weight bearing : 6 weeks
(3) Removal of plaster : 10 weeks
(4) Active knee movements
(5) Crepe bandage

(2) **Comminuted Fracture :**

(A) Manipulative reduction :

(*a*) Manipulations : traction → adduction → compression

↓ (b) Fixation ·
In : Knee extended
By : Plaster cast
For. 10 weeks
(c) Quadriceps drill and joint exercises
(B) Operative reduction + arthroplasty
↓ Plaster immobilisation for 12 weeks

Compl : (a) **Avascular necrosis**
(b) **Degenerative arthritis**

(B) **T or Y intercondylar fracture ;**

Etio · (1) Direct trauma : fall on knee
(2) Indirect trauma fall on feet

(C) **Spine :** In association with rupture of crucial ligaments
(See Internal derangements of the knee)

(D) **Separation of the upper tibial epiphysis**

(E) **Tibial Tubercle :**

(1) **Fracture of tibial tubercle : Incomplete**
Etio Forcible manipulations of the knee
Path . Fissures and partial separation
Clinic Local signs of fracture
Treat . **Active flexion exercises**

(2) **Complete avulsion of Tibial tubercle epiphysis**

Etio : High jumps
(1) Separation of separate ossification centre
Treat · Operative suture
(2) *Separation of continuous ossification centre*
Treat : Plaster immobilisation for 2 months

General clinical features of fracture upper extremity of tibia

(1) History . of direct or indirect trauma
(2) **Effusion** into the knee joint
(3) **Local signs** of fracture

Compl : (1) **Avascular necrosis**
(2) **Joint :** (a) Adhesions
(b) Osteoarthritis
(3) **Deformities :** genu valgum or varum

Treat : of Fracture upper extremity of tibia in general

(A) **Slight displacement :**
Rest over a pillow with early massage and movements

(B) **Marked displacement :**
(1) **Reduction :** By traction + extension + manipulations

(2) **Fixation:**
In: Knee extended or slightly flexed
By: (*a*) Thomas' knee splint
(*b*) McIntyre's splint
(*c*) Plaster case: toes to groin
For: 10 weeks

(3) **After-treatment:**
(*a*) Quadriceps drill
(*b*) Walking Calliper:
(*c*) Weight bearing: after 6 weeks
(*d*) Active knee exercises and crepe bandage
(*e*) Knee guard

(C) **Wide and persistent displacement: Bone pegging**

(II) SHAFT:

Etio: (1) Direct trauma. transverse fractures
(2) Indirect trauma: Oblique and spiral fractures
Path: (1) Complete: transverse; oblique; spiral
(2) Incomplete: subperiosteal, greenstick
Clinic. Local signs
Treat:
(1) **Reduction:** (*a*) Manipulations
(*b*) Traction: skeletal pin
(2) **Fixation:**
In: Knee flexed 10°
Ankle at right angles
Leg in neutral position
By: (*a*) Back splint with side pieces
(*b*) Braun's splint
(*c*) McIntyre's splint
(*d*) Thomas' splint
(*e*) Plaster cast: toes to groin
(3) **After-treat:**
(*a*) Weight bearing: in 4 weeks
(*b*) Knee joint free: in 8 weeks
(*c*) Plaster removal: in 12 weeks

(III) LOWER EXTREMITY:

Varieties:
In association with ankle fracture-dislocations
(A) Internal malleolus
(B) Transverse supramalleolar
(C) Separation of lower tibial epiphysis

Etio: (1) Direct trauma
(2) **Indirect trauma:**
(a) Eversion: associated with Pott's
(b) Inversion: associated with Wagstaffe

Clinic: (1) History
(2) Local signs
(3) Periankle swelling and deformity

Treat: (1) Reduction by manipulations under anæsthesia
(2) **Fixation:**
In: Foot inverted
By: Plaster-of-Paris
Extent: Toes to tibial tubercle
For: 6 to 8 weeks
(3) After-treatment
(a) Toe and knee exercises
(b) **Raising the inner side of the sole**

Treatment of special fractures of tibia.

(1) Oblique fractures of tibial shaft
(A) Manipulative reduction → plaster fixation
(B) Skeletal traction
(C) Operation
Ind. Failure of A and B above
Tech. Exposure
↓ Reduction
↓ Fixation by pin (projecting)
↓ Plaster fixation
After-treat: Removal of pin after 2 weeks
Removal of plaster after 6 weeks

(2) Fracture tibia with slow union
Site: Lower half
Cause: (a) Insufficient vascularity
(b) Inefficient immobilisation
Treat. Complete immobilisation till complete union

(3) Un-united fracture of tibial shaft
Treat: (1) Bone graft
(2) Double tibiofibular synostosis

(4) Open fractures of tibial shaft
Treat: (1) Exploration
(2) Debridement
(3) No sutures
(4) Pin incorporated in plaster with window
(5) Weight traction over Braun's splint

(5) Infected fracture of tibial shaft:
Treat. Winnett orr: Changed every month

(17) FIBULA:

Etio: (1) **Direct trauma**: anywhere in the shaft

(2) **Indirect trauma:**
(a) **Pott's fracture**
(b) **Neck:** In knee torsions

Path: (1) **Isolated**
(2) **Complicated:** Associated with:
(a) Fracture external tuberosity of tibia
(b) Rupture of the knee ligaments
(c) Fracture dislocation ankle

Clinic: Local pain referred by **springing of the fibula**

Treat: (1) Crepe bandage
(2) **Plaster-of-Paris fixation**

Compl: (1) Trauma to **ext. popliteal nerve** (fracture neck)
(2) Rupture of ext. lateral ligament of knee

Fracture both the bones of the leg.—

Etio: (1) **Direct** trauma. same level
(2) **Indirect** trauma:
(a) Tibia: junction of lower and middle third
(b) Fibula. upper end or middle

Path: Displacement: upper frag: forwards
lower frag: backwards + upwards + everted
overriding and lateral displacement

Clinic: Local signs of fracture

Treat: (A) **Conservative: Traction – immobilisation**
(1) **Reduction:** By
(a) **Manipulations** under anæsthesia
(b) **Traction: tibial traction apparatus**

Tech: (1) Position: leg hanging vertically
↓ (2) Insertion of pin: one inch above the ankle
↓ (3) Reduction of fracture: (a) Strong traction by stirrup
↓ (b) Manual lateral pressure
↓ (4) Application of plaster:
By: (a) Plaster slab. toes to upper calf
(b) Plaster cast: toes to tibial tubercle
↓ tibial tubercle to midthigh
In: Knee flexed to 135°
For: 8-10 weeks
↓ (5) Continuous traction:
Ind: Unstable oblique or spiral fracture
Tech: (1) Braun's splint
(2) 15-pounds traction attached to the stirrup
(3) Raise the foot of the bed

↓ (6) **Removal of pin and replaster:**
Ind: Subsidence of swelling
Tech: (*a*) Limb in tibial traction apparatus
(*b*) Renewal of plaster:
· toes to groin
: knee slightly flexed
(*c*) Removal of pin

(7) **Duration of immobilisation:**
(*a*) 8–10 weeks
(*b*) Clinical union
(*c*) Radiographic union

(8) After-treat: (*a*) Unna's paste dressing from toes to knee
(*b*) Crepe bandage to the knee
(*c*) Toe drill immediate

(2) **Fixation:**
In: Knee flexed 10°
Leg straight and neutral
Ankle at right angles

By: (A) **Splints**
(*a*) Back splint with foot and side pieces
(*b*) McIntyre splint
(*c*) Braun's splint

(B) **Plaster-of-Paris:**
(*a*) Ordinary
(*b*) Bradawls

(C) **Traction Pin or Wire**
At: (*a*) Tibia
(*b*) Os calcis
With. weight

(3) **After-treatment:**
(*a*) **Traction for 4 weeks**
(*b*) **Weight bearing after 6 weeks**

(B) **Operative Treatment**
Ind. (1) **Primary**
(*a*) **Open and infected fractures**
(*b*) **Failure of traction**
(2) Intermediate: mal-union
(3) Delayed · non-union

Operations: (1) **Lane's plates** · Transverse shaft fractures
(2) **Bands & wires:** Oblique fractures
(3) **Intramedullary pegs:** Transverse fractures
(4) **Inlay grafts:** Non-union

After-treat: Plaster: from toes to mid-thigh
: for 8–10 weeks

(18) FRACTURE DISLOCATIONS ROUND ABOUT ANKLE JOINT

(1) ABDUCTION AND EVERSION INJURIES POTT OR POTT-DUPUYTREN

(A) Fracture external malleolus

(B) (1) Fracture external malleolus
+(2) Rupture internal ligament
+(3) Outward dislocation astragulus

(C) (1) Fracture external malleolus
+(2) Rupture internal ligament
+(3) Posterior marginal tibial fracture
+(4) Out and back dislocation astragulus

(D) (1) Oblique fracture of the fibula. Within three inches of ankle
+ (2) Rupture internal ligament
or (3) Avulsion internal malleolus
} **Pott**

(2) ADDUCTION AND INVERSION INJURIES:

(A) Fracture internal malleolus

(B) (1) Fracture internal malleolus
+ (2) Rupture external ligament
+ (3) Inward dislocation astragulus
} **Wagstaffe**

(C) (1) Fracture internal malleolus
+ (2) Rupture external ligament
+ (3) Posterior marginal tibial fracture
+ (4) In and back dislocation of astragulus

(3) VERTICAL COMPRESSION INJURIES:

Excessive dorsiflexion

(A) (1) Anterior marginal tibial fracture
+ (2) Forward dislocation astragulus
+ (3) Comminuted fracture malleoli

(B) (1) Rupture of tibio-fibular interosseous ligament
+ (2) Central dislocation of astragulus
} **Dupuytren**

(4) DIRECT TRAUMA FRACTURES:

(A) Fracture both bones just above the ankle
(B) Supramalleolar transverse tibial fracture
(C) Separation of lower tibial epiphysis

(5) EPIPHYSIAL INJURIES:

(A) **Abduction-rotation** displacement: out and back
(B) **Adduction** injuries:

Etio: Inversion strain
Path: Compression of lower tibial epiphysis
↓ Premature union
↓ Talipes varus

Treat: (1) Osteotomy: after 20
(2) Epiphyseodesis

Signs and symptoms of the fractures round about the ankle

(A) **Deformities:** Displacements
- (1) **Backward** displacement of the foot
  - (a) Short dorsum
  - (b) Prominent heel
- (2) **Outward or inward** lateral displacement
- (3) **Inversion or eversion:** Wagstaffe or Pott
- (4) **Broadening** of malleoli: Dupuytren
- (5) **Foot-drop**

(B) **Ankle joint effusion**

Treatment of fractures round about the ankle

(A) GENERAL CONSIDERATIONS:

(I) **Conservative:**

(1) **Reduction:** (A) **Manipulations:** Under anæsthesia with flexion of the knee joint
(B) **Traction:** os calcis pin

(2) **Fixation:**

In: Foot:
- at right angles
- no lateral displacement
- no posterior displacement
- slight inversion

By. (a) **Stockinet** suspension
(b) **Splint:** Footpiece with raised inner border + side leg piece
(c) **Plaster-of-Paris**
- (α) Plaster with pin & stirrup extension
- (β) Delbet walking plaster
  Walk with stick: 7 days
  Walk with no stick: 12 days
  Plaster removal: 60 days

(d) **Os calcis pin traction:** 3 weeks

(3) **After-treat:** (a) Toes and knee exercises: immediate
(b) **Thickening sole margins:** 3 months

(II) **Operative:**

Ind: (A) **Primary:** (1) Dupuytren
(2) Loose fragments
(3) Compound fractures

(B) **Secondary:** Deformities
Treat: Ostostomy above the ankle
↓ Plaster fixation for 3 weeks

(B) TREATMENT OF INDIVIDUAL INJURIES:

(1) ABDUCTION-EVERSION INJURIES

(A) **Fracture external malleolus with no displacement**
(*a*) **Strapping**
+ (*b*) **Leriche's:**
Local injection of anæsthesia
+ (*c*) **Walking plaster for 3 weeks**

(B) **Fracture external malleolus + avulsion int. ligament**
(*a*) Manipulative reduction of astragulus
. Inward pressure on external malleolus
↓ (*b*) Fixation
By: Plaster-of-Paris
Extent: Toes to tibial tubercle
For: 10 weeks

(C) **Fracture Malleolus with out and back displacement**
(*a*) **Manipulative reduction**
: Pull the foot forwards & inwards
(*b*) **Fixation**
By: Plaster
Extent: Toes to tibial tubercle
For: 10 weeks

(2) ADDUCTION-INVERSION FRACTURES:

Treatment same as in abduction-eversion fractures: the manipulations being in the opposite direction

(3) VERTICAL COMPRESSION INJURIES:

(A) **Manipulative:**
(*a*) **Posterior plaster slab with elevation**
: Till swelling disappears
↓ (*b*) **Manipulative reduction**
: Push foot backwards & downwards

↓ (c) **Fixation:**
In: Plantar flexion
By: Plaster-of-Paris
Extent: Toes to tibial tubercle
For: 12 weeks

(B) **Os calcis skeletal pin extension** on Braun's splint for 6 weeks:
Ind: Failure of manipulative reduction

Complications after fracture dislocations of ankle.

(1) **Mal-union with deformities:**
Treat: (A) **Late manipulations: upto six weeks**
(a) Manual
(b) Wedge
(c) Wrench
(d) Osteoclast
(B) **Operative reduction**
(C) **Osteotomy of the tibia:**
Ind: Talipes valgus
Site: One inch above ankle
(D) **Arthrodesis of ankle:**
With. Tibial graft
In: Neutral position
Equinus 5°–10°
After-treat: Padded plaster. 3 weeks
Unpadded cast with weight bearing. 10 weeks

(2) **Ankylosis of the ankle**
(3) **Osteoarthritis of the ankle or knee**
(4) ***Tenosynovitis***

(19) OS CALCIS:

Etio Falls from a height: Ladder workers

Classific (A) Isolated fractures without joint injury
(a) Vertical fracture of medial process of tuberosity
(b) *Horizontal fracture of medial tuberosity*
(c) Sustentaculum tali
(B) Comminuted fracture with minimal joint injury
(a) Fissure fracture
(b) Fracture outer wall and body
(C) Comminuted fracture with severe joint injury
(a) Outer part of posterior articular surface
(b) Whole posterior articular surface
(c) Anterior articular surface

Sites. (1) Tuberosity: heel
(2) Neck
(3) Sustentaculum tali
(4) Body
(5) Articular surface

Clinic: (1) History of a **fall from height**
(2) Painful and **tender heel**
(3) Œdema and ecchymosis round the heel
(4) **Local broadening:** (as seen from the back)
(5) Spasm of the tendons
(6) Antero-posterior and lateral **X-Ray** plates

Treat:

(A) General Principles:

(1) **Reduction:** By manipulations under anæsthesia
(2) **Fixation:**
In: Foot: at right angles
slightly inverted
arch restored
By: Plaster cast
For: 2 months
(3) After-treatment. (*a*) immediate toe and knee exercises
(*b*) gradual weight bearing

(B) Individual fracture treatment:

(1) ISOLATED FRACTURES:
(A) Vertical fracture of the tuberosity.
(*a*) Walking plaster for 6 weeks
↓ (*b*) Viscopaste dressings
(B) Beak fracture:
(*a*) Manipulations: with foot in plantarflexion
+ (*b*) Walking plaster in slight plantarflexion for 6 weeks
↓ (*c*) Viscopaste dressings
(C) Avulsion fracture of tuberosity·
Operative fixation by catgut
(D) Sustentaculum Tali:
Walking plaster for 6 weeks

(2) COMMINUTED FRACTURES WITH MINIMAL JOINT INJURY
Fixation:
By: Plaster-of-Paris
Extent: Toes to tibial tubercle
For: 6 weeks
With: Immediate weight bearing

(3) COMMINUTED FRACTURES WITH JOINT INJURY
(*a*) Crepe bandage from toes to knee
+ Elevation of leg till œdema disappears
↓ (*b*) Reduction: by.
(1) Transfixion pin.
(*a*) Double: (α) Os calcis
(β) Supra-malleolar
(*b*) Single:
+ (2) Bohler's compression clamp
↓ (*c*) Fixation:
By: Plaster-of-Paris
Extent: Toes to tibial tubercle

III. BONE INFLAMMATIONS:

(I) POST-TRAUMATIC INFLAMMATIONS:

(A) PERIOSTEUM:

(A) **Acute traumatic periostitis**
(B) ***Chronic traumatic periostitis*** } trauma + infection

(C) Traumatic ossifying periostitis of the new born.
Etio. Twisting traction of the limb by an accoucher
Site: (1) Humerus, (2) Femur
Path. Tearing and separation of periosteum and epiphysis → ossifying periostitis
Clinic. (1) Painful movements
(2) Swelling
(3) Ecchymosis
Treat Conservative

(B) EPIPHYSIS:

(I) OSTEOCHONDRITIS JUVENILIS: CHONDRO-EPIPHYSITIS

Def. **Chronic inflammation occuring in the epiphysis subject to undue repeated stresses and strains** and at an age determined by the time of appearance *and fusion of the affected epiphysis*

Etio. (1) Repeated minor **strains and stresses:**
(*a*) at particular **age**
(*b*) at particular **site**
(2) Hypothyrodism (Med. Ann. 1940)

Path. Morb. anat. epiphyses.
(*a*) Partial arrest and irregularity
↓ (*b*) Sclerosis
Theories.
(A) **Post-traumatic:**
(*a*) Partial separation due to minor trauma
(*b*) **Avascular necrosis: traumatic**
(B) **Insidious:**
(*a*) Aseptic embolism
(*b*) **Low grade infection**
(*c*) Hypothyrodism

Sites:

Clinic: (1) **Insidious:** No history of trauma
(2) **Post-traumatic:**
(*a*) **Immediate** & acute
: partial separation of epiphysis
(*b*) **Delayed** and gradual
: avascular necrosis of fracture fragment

(1) Osteochondritis of the hip : Von Perthe

Etio : Age : **5-10 years**

Path : **Post-traumatic avascular necrosis of femoral head**

Clinic : (A) **Onset :**

(1) **Slightly painful limp**

(2) Hip spasm in flexion + adduction

(B) **Active :**

(1) **Restricted abduction and inversion**

(2) Free flexion and extension

(C) **Recovery :**

(1) **Limitation of abduction**

(2) Coxa Vara

Signs. (1) Palpation : Thickened and prominent trochanter

(2) **X-Ray :**

(*a*) Mushroomed fragmented head

(*b*) Broadened and shortened neck

Compl : (1) **Coxa Vara**

(2) Osteoarthritis

Treat : (1) Acute Stage : recumbency and traction

(2) Subacute : immobilisation of the hip

(3) Chronic : walking calliper

Complete freedom from weight bearing and continuous traction for twelve to twenty-four months

(2) Tibial apophysitis : Osgood Schlatter

Def : Avulsion osteochondritis of the **tibial tuberosity**

Etio : Boys between **10 and 16**

Predisposers : (1) Trauma :

(*a*) traction : avulsion

(*b*) direct : contusion

(2) Separate developmental centre

Clinic. (A) Insidious :

(1) No history of trauma

(2) Painful, tender, swollen tubercle

(B) **Traumatic :**

(1) History of Injury

(2) Painful knee extension

(3) **Painful, tender, swollen tubercle**

X-Rays :

(*a*) Fragmentation
\+ (*b*) Partial separation
\+ (*c*) Bony sclerosis
} of the tubercle

Treat : **Fixation :**
- in : **knee fully extended**
- by : **Plaster-of-Paris**
- extent : **Toes to the groin**
- for : **three months**

↓ (2) **Walking splint** with Calliper :
for : three months

↓ (3) No athletics :
for : three months

(3) **Apophysitis of os calcis : Sever's**

Def : Osteochondritis of the epiphysis of the os calcis

Etio : Boys between **10 and 16**
Trauma

Clinic. (1) Painful limping
(2) **Tender heel**
(3) X-Ray : fragmentation and irregularity of epiphysis

Diff. diag. (1) Spur
(2) Periostitis
(3) Bursitis
(4) Fibrositis

Treat **Boot** with cut back and raised heel

(4) **Osteochondritis of the tarsal navicular : Kohler**

Etio : Boys between **3 and 8**
Cause : stress and strain

Path : Avascular necrosis

Clinic (1) **Painful limp**
(2) Painful, **tender, swollen navicular**
(3) X-Ray smaller, irregular, denser bone

Diff. diag. **T. B. Tarsus**

Treat : (1) Recumbency with strapping
↓ (2) **Walking plaster**
↓ (3) Raise the inner border of the sole

(5) **Osteochondritis of the second metatarsal head : Freiburg**

Clinic : (1) **Local** pain, tenderness and swelling
(2) X-Ray : fattening, irregularity and sclerosis

Treat : (1) **Conservative**
(2) Excision of the metatarsal head

(6) **Osteochondritis of lower radial epiphysis : Madelung**

Etio : Adolescent **girls between 15 and 25**
Typists

Path : (1) Deficient growth of lower radial epiphysis
(2) Normal ulna

Clinic: **Manus valgus :** *Hand displaced outwards and forwards*

(7) Vertebral epiphysitis : Scheuermann—Calve

Etio: Age: **between 10 and 20**

Sites: Surfaces of thoracic or upper lumbar vertebræ

Clinic: (1) Pain, tenderness, deformity (kyphosis)
(2) **No fixity and spasm**
(3) X-Ray: (*a*) Irregularity and density of verte-bral margins
(*b*) Narrow intervertebral space

(8) Post-traumatic carpal dystrophy : Keinboch

Def: Post-traumatic osteochondritis of **carpal semi-lunar**

Etio. (1) Adults—girls between 6–16 yrs.
(2) Trauma . **sprain of the wrist**

Path . (1) Alteration in structure
\+ (2) Irregular patchy decalcification + sclerosis

Theory: Avascular necrosis

Clinic: (1) History of trauma
(2) *Recurrence of* **wrist disability**
(3) Local pain, tenderness, swelling
(4) **Finsterer's sign :** Pain on tapping 3rd metacarpal head
(5) **Head of third metacarpal less prominent**
(6) X-Ray : irregular patchy density

Diff.-diag · (1) **Non-union** of fracture navicular
(2) Sprain wrist
(3) T. B. Wrist
(4) Osteoarthritis wrist
} **Wrist affections**

Treat · **Fixation in plaster for six months**
↓ Leather support for one year

(II) OSTEOCHONDRITIS DISSECANS.

Etio: (1) Trauma · repeated and slight
(2) Thrombosis

Path: **Avascular bone necrosis**

Sites: Knee; elbow; ankle

(C) BONE:

(1) **Post-traumatic rarefying osteitis and spondylitis**

(2) **Avascular necrosis :**
(See under fracture complications)

(II) INFECTIVE INFLAMMATIONS OF THE BONE:

(A) PERIOSTEUM:

(1) INFECTIVE PERIOSTITIS:

Etio: Infection from:

- (A) **External**: (1) Trauma: (*a*) closed
  - (*b*) open
  - (2) Infection from soft tissues
- (B) **Local**: Contusion
- (C) **Internal**: Osteomyelitis
- (D) **Circulation**: Specific

Path: (1) Hyperæmia
- (2) Separation from underlying bone
- (3) Subperiosteal abscess or new bone formation
- (4) Superficial necrosis of bone
- (5) Periosteal perforation
- (6) Soft tissue abscess
- (7) Sinus

Clinic. (A) **Acute**: (See under acute osteomyelitis)
- (1) Localized painful tender **swelling adherent to a bone**
- (2) *Acute overlying* ***inflammation***
- (3) General toxæmia

(B) **Subacute**: As in (A) but milder

(C) **Chronic**: (See under chronic osteomyelitis)
- (1) Nodular or diffuse fusiform hard **swel*ling*** *on the bone surface*
- (2) Unhealing **ulcer or sinus**

Signs: X-Ray: (1) Acute: raised periosteal line
- (2) Chronic: bony thickening or erosion

Compl: (1)
(2) *in-*

. Tuberculosis

- (3) **Osteomyelitis**
- (4) **Necrosis** of underlying bone
- (5) Non-healing **ulcer or sinus**

Treat: (1) **Conservative**:
- (A) Local: rest, elevation, immobilization, counterirritation, hyperæmia
- (B) General: (*a*) antiseptic
  - (*b*) antispecific

(2) **Operative**:
- Ind: (1) Subperiosteal **abscess**
  - (2) Chronic **periostitis**

Tech: (1) Periosteal **incision and drainage**
(2) Periosteal **incision and scraping**

(2) LEONTIASIS OSSEA: (See Face)

(3) SPECIFIC PERIOSTITIS: (See under specific affections of bone)

(B) BONE:

(1) ACUTE AND SUBACUTE INFECTIVE OSTEOMYELITIS:

Def: **Pyogenic Septicæmia** with metastatic suppurative inflammation **starting as a localized focus in a bone** and rapidly spreading to its component parts causing widespread necrosis and suppuration

Etio: Age: **3 to 10**
Sex: **Boys**

Predisposers: (1) **Trauma**: Juxta-epiphysial hæmatoma
(2) **Infective focus**: Boil, furunculosis
(3) Low general resistance

Bact: (1) **Staphylococcus aureus** and albus
(2) **Streptococcus**
(3) Pneumococcus

Path: **Suppuration under tension in a rigid cavity**

Sites of origin: (1) **Metaphysial**: Long bones
(2) **Subperiosteal**: Flat bones
(3) Epiphysial:
(4) **Medullary**: Short bones

Factors for site: (A) **Blood supply**
(1) Metaphysial system (long bones)
: Metaphysis
(2) Subperiosteal system (flat bones)
: Periosteum
(3) Nutrient artery: (short bones)
: Medulla
(B) **Embryonic nature**: Of the metaphysis

Morb. anat: (a) Juxta-epiphysial **hæmatoma**
\+ (b) Septicæmia from a septic focus
↓ (c) Metaphysial **abscess**
↓ (d) **Spreading inflammation under tension**

(b) **Brodie's abscess:**
(c) **Epiphysial separation:**
(α) Deformity
(β) Stunted growth
(d) **Spontaneous fracture**

(2) **Joints:**
(a) **Sympathetic effusion**
(b) **Infective effusion:** Via
(1) Periosteum and capsule
(2) Intra-articular metaphysis
(3) Epiphysis
(4) Intra-articular tendon
(5) Blood-borne: synovium
(c) **Ankylosis**
(d) **Pathological dislocations**

(3) **Muscles & Tendons: Stiffness** an fibrosis

(4) **Nerves:** Inclusion in **fibrosis**

(5) **Blood-vessels:**
(a) Secondary **hæmorrhage**
(b) **Thrombosis** and septic embolism

(C) **Special:**
(1) **Skull:** (a) **Sinus thrombosis**
(b) **Extradural abscess**
(c) Meningitis
(2) **Mandible:** (a) **Cervical cellulitis**
(b) **Œdema glottis**
(c) **Aspiration or septi pneumonia**
(d) **Cancrum oris**
(3) **Vertebræ:** (a) Mediastinitis
(b) Empyema
(c) Psoas abscess
(4) **Pubis:** Hæmaturia

Treatment:

Principles: (1) **Decompression and Drainage: Starr**
(2) **Closed antiseptic immobilization: orr**
(3) **Sequestrotomy:** When required

(A) **General treatment:**
(1) **Specific:** (1) **Suphonamide** group.
(a) Oral
(b) Injections
(2) Antisera
(3) Immuno-transfusion

(2) **Eliminative** treatment: Laxatives and diuretics

(3) **Tonics:** Iron

(B) **Local treatment:** (for operative details see under 'Bone operations')

(1) **Uncomplicated acute osteomyelitis:**

(*a*) **Periosteal incision and drainage**

↓ (*b*) **Starr's treatment: Multiple drilling or trephining**

Ind: Non-amelioration **within 24 hours** after periosteal incision

(*c*) **Diaphysial drainage: 'Gutter operation'**

Ind: (α) Medullary osteomyelitis
(β) Metaphysial osteomyelitis spreading to medulla
(γ) **Chronic osteomyelitis**

(*d*) **Sub-periosteal resection of diaphysis**

(1) Total
(2) Partial

Ind: (α) Sub-acute osteomyelitis
(β) Separation of the whole periosteum

(2) **Acute osteomyelitis with suppurative arthritis:** (Of the knee)

Sites: (1) Lower end of the femur
(2) Upper end of the tibia

Tech: (1) **Aspiration of the joint:** → Bacteriological exam.

(*a*) **If sterile: Leave alone**

(*b*) **If infected:**

(α) **Repeated intermittent aspirations**
↓ (β) **Arthrotomy** and drainage
↓ (γ) **Amputation:**

Ind: (*i*) Low general condition
(*ii*) Pyæmia
(*iii*) Bad local condition

+ (2) **Operation for acute osteomyelitis:**

(3) **Septicæmia multiple foci of osteomyelitis and suppurative arthritis**

(1) General antispecific treatment
↓ (2) Local treatment as required

After-treatment of osteomyelitis:

(1) **Splinting with weekly dressings**

(2) **Winnett orr :**
- (a) Drying the bone with **iodine and spirit**
- (b) Sterile **vaseline or paraffin** gauze pack
- (c) No sutures
- (d) **Plaster-of-Paris** closure for 4-8 weeks.

Sequence of treatment of acute osteomyelitis :

(1) **General**
↓ (2) **Local :**
- (a) Periosteal incision and drainage
- ↓ (b) [illegible] ning
- ↓ (c) **Diaphysial drainage** or **Gutter operation : Subacute stage**
- ↓ (d) **Sequestrotomy : Chronic stage**
- ↓ (e) **Subperiosteal resection of diaphysis : Chronic stage**
- ↓ (f) **Amputation : Life in danger**

Amputation for acute ostoemyelitis

Indications :

(1) **General :**
- (a) Fulminating toxæmia
- (b) Septicæmia
- (c) Pyæmia
- (d) Chronic amyloid toxæmia

(2) **Local :**
- (a) Acute infective arthritis
- (b) Secondary hæmorrhage
- (c) Spontaneous fracture

Some special sites of osteomyelitis

(1) Upper end of the Femur :
- Site : (a) Capital : (Joint infected secondarily)
  - (b) Great trochanter
- Treat : Early operation
  - (1) Drilling of femoral neck through the trochanter
  - (2) Drainage of hip joint if necessary
- Seq : (1) Shortening
  - (2) Ankylosis

(2) Maxilla :
- Etio : Age : Children
- Path : (a) Periostitis
  - (b) Osteomyelitis
- Clinic : (1) Profound toxæmia with high temp.
  - (2) Unilateral swelling of the face
  - (3) Orbital cellulitis
  - (4) Superficial Abscess
- Compl : Intracranial : Sinus thrombosis, Meningitis ; Brain abscess
- Treat : (1) Conservative
  - (2) Conservative operations : incisions into the mouth

(2) CHRONIC INFECTIVE OSTEOMYELITIS:

Etio: (1) **Post-acute**: Sequela of acute osteomyelitis
(2) **Traumatic**: Contusions; infected fractures
(3) **Insidious**:

Path: (1) **Sequestrum**: Dead bone
(2) **Involucrum**: Subperiosteal new sclerosed bone surrounding the sequestrum
(3) **Cloacæ**: Apertures or sinuses in the involucrum leading to the cavity containing the sequestrum

Processes: (*a*) **Sclerosis**
(*b*) **Rarefaction**
(*c*) **Necrosis**: (α) Molecular
(β) *En masse*

Clinic: (1) Hard irregular **swelling** of a bone
(2) **Abscess** near about a bone
(3) **Sinus**
(4) **X-Ray**

Treat: (1) Sequestrotomy
↓ (2) Winnett orr

Some special varieties of chronic suppurative osteomyelitis:

(A) **Diffuse** osteoperiostitis: **Chronic hypertrophic osteomyelitis**

Etio: Adults; 10–20 years

Sites: Humerus, femur, tibia

Path: **Diffuse sclerosis** of the whole circumference of the whole length of the bone (Subperiosteal and endosteal)

Clinic: (1) Boring pain with deep tenderness
(2) Diffuse fusiform diaphysial sclerosis
(3) X-Rays: diffuse sclerosis
patchy rarefaction
medullary narrowing

Diff. Diag: (1) Callus
(2) Diffuse **syphilitic** periostitis
(3) Osteitis deformans
(4) Sarcoma: **Ewing**

Treat: (1) **Gutter operation**
↓ (1) Winnett orr

(B) **Brodie's abscess:**

Def: Primarily **chronic metaphysial central staphylococcal abscess** walled in by dense sclerosis with periodic acute exacerbations

(2) Slipped epiphysis: **osteochondritis** juvenilis
(3) Joint tuberculosis
(4) Soft tissue tuberculosis
(5) New growths: myeloma; sarcoma

Complications:

(1) **Cold abscess**
(2) **Sinuses**; ulcers, soft tissue implications
(3) Secondary infection
(4) Waxy disease

Treatment:

(1) **General:** Anti-tuberculous
(2) **Local:**
- (A) **Conservative:**
  - (1) Immobilization. (*a*) splints
    - (*b*) **plasters**
  - +(2) Bier's congestion
  - +(3) Ultra-violet exposures
- (B) **Operative:**
  - (1) Conservative operations.
    - (*a*) **Aspiration** of cold abscess
    - (*b*) **Curettage** with BIPP
  - (2) Radical operations·
    - (*a*) **Excision:** Rib, tarsum
    - (*b*) Amputation

(2) SYPHILIS OF THE BONE·

Path: (1) **Osteocopic pains:** Early secondary syphilis
(2) **Periostitis:**
- Sites (A) Long bones· (*a*) **Localized:**
  - (α) shaft
  - (β) epiphysis
  - (*b*) **Diffuse**
- (B) Flat bones: Parrot's nodes
- Periods· (*a*) Y[illegible]
  - (*b*) [illegible]
  - (*c*)

(3) **Osteosclerosis:**
Subperiosteal + endosteal sclerosis
Sites: (*a*) **Diffuse:** Sabre tibia
(*b*) **Localized**
Period: **Young congenitals** of school age

(4) **Gummata:** (A) **Periosteal**; (B) **Endosteal**
Sites: (*a*) Localized
(*b*) Diffuse
(*c*) Central
Period: **Tertiary** syphilis

(5) **Epiphysial changes:**

(A) **Irregular development**

(B) **Osteochondritis**

(C) **Separation:** Parrot's pseudoparalysis
Period: Infants with congenital syphilis before the **end of first year**

(6) **Craniotabes:** Abnormal thinning of skull bones
Period: Congenitally syphilitic children **within first 6 months**

Clinic:

(1) **Bone lesions**

(A) **Congenital Syphilis:**

(1) **Osteochondritis of nasal septum:**
(a) **Snuffles**
(b) **Depressed nasal bridge**

(2) **Craniotabes:**

(3) **Parrot's Nodes:**
(a) **Hot cross bun head**
(b) **Natiform head**

(4) **Epiphysitis:** Pseudoparalysis of **Parrot**

(5) **Dactylitis:** Osteoperiostitis of { metacarpals / metatarsals / phalanges }

(6) **Sabre Tibia:**
(a) Anteroposterior curve
(b) No buttress in the concavity
(c) Whole length affected

(7) **Teeth:**
(a) **Hutchinson:**
: Notched and pegshaped permanent incisors
(b) **Moon:**
: Permanent molars

(B) **Acquired Syphilis:**

(1) **Primary:** Nil

(2) **Secondary:**
(a) **Osteocopic pains**
(b) **Periosteal nodes:** Syphilitic periostitis

(3) **Tertiary:**
(a) **Periosteal gumma**
: Firm tender swelling over a bone
↓
↓
↓

↓ Bursting gumma
↓ Bone necrosis
↓ Ulcerations, perforations, depressions
Sites: Tibia; **Sternum; Palate; Nose;** skull; clavicle

(*b*) **Endosteal gumma:**
: Boring, aching, nocturnal pain
↓ : Local bone thickening

(*c*) **Diffuse sclerosis:**
. Heavy bone with obliteration of medullary cavity

(2) **Other stigmata of syphilis**
(3) **Wassermann or Kahn reaction positive**
(4) **Therapeutic test positive**

(IV) METABOLIC DISEASES OF BONE:

(A) VITAMINE DEFICIENCY DISEASES:

(1) *RICKETS*

Def. Disturbance of bone formation resulting in **'abundant osteoid matrix with defective calcification' due to perversion** of general metabolism **of calcium and phosphorus**

Varieties: (*1*) ***Fætal: Osteogenesis imperfecta*** *congenita*
(2) **Infantile: Rickets** proper
(3) **Adolescent:**
(*a*) Recrudescence of infantile rickets
(*b*) Hunger osteodystrophy
(4) **Adult: Osteomalacia**

(A) **Infantile rickets:**

Etio: Age. **6 months to 2 years**
Surroundings: (*a*) Lack of sunshine
(*b*) **Lack of vitamines** (vitamin D)

Path: (1) **Vitamin D deprivation**
↓ (2) Failure of phosphorus absorption from intestines
↓ (3) **Perversion of calcium phosphate metabolism**
↓ (4) *Temporary* **disturbance of ossifying** process

Morb. anat: (*a*) [illegible] cartilage cells
(*b*) [illegible]
(*c*) [illegible]
(*d*) [illegible]

(1) **abundant osteoid matrix + defective calcification**

↓ **Imperfectly calcified immature osteoid tissue**

\+ (*a*) Bodyweight
(*b*) Posture
(*c*) Muscle pull
} → deformities

(2) **Blood: Normal calcium; reduced phosphorus**

Clinic:

(1) **Respiratory disturbances**

(2) **Gastrointestinal disturbances**
: Pot belly; enlarged liver; dyspepsia

(3) **Bone changes:**

(A) **Epiphysial enlargement:** (*a*) Wrist
(*b*) Ankle

(B) **Deformities:**

(*a*) **Head:** (α) Craniotabes
(β) **Persistent Fontanelles**
(γ) Brachycephalus

(*b*) **Teeth:** (α) **Delayed eruption**
(β) Concave edges
(γ) Deficient enamel
(δ) Caries

(*c*) **Jaws:** Faulty bite

(*d*) **Spine:** (α) Kyphosis
(β) Scoliosis

(*e*) **Thorax:** (α) **Rickety rosary**
(β) **Pigeon breast**
(γ) Harrison's sulcus

(*f*) **Pelvis:** (α) **Flattened**
(β) Oval
(γ) Triradiate

(*g*) **Extremities:** (1) **Coxa vara**
(2) **Genu valgum**
(3) Genu varum
(4) **Flat foot**
(5) Bow legs

Rickety bones: (A) **Curves:**

(1) Exaggeration of natural curves
(2) Curves at the insertion of muscles
(3) Curved weight-bearing bones

(B) **Buttresses in the concavity**

Compl: (1) Gastrointestinal
(2) Respiratory

(3) Laryngeal spasm
(4) Convulsions
(5) **Deformities** and their sequelæ
(6) Fractures

Treat:

(1) **General:**

(A) **Correction of faulty diet and hygiene**
(a) Sunshine & **ultra-violet** rays
(b) Milk, eggs, meat-juice

(B) **Medicinal: Cod-liver oil**
Calcium
Vitamin D

(2) **Local:** Deformities ·

(A) **Preventive:**
(a) Non or guarded weight bearing
(b) Splints, supports, appliances

(B) **Curative:**

(1) **Operation:**
(a) Manual osteoclasis
or (b) Osteotomy: (β) linear
(α) cuneiform

↓ (2) **Correction of Deformity**

(3) **Fixation:**
in: **position of slight over-correction**
by. **Plaster-of-Paris**
for: **three to four weeks**

(B) Adolescent Rickets:

Synonyms *Famine osteomalacia*
Hunger osteodystrophy . famines

Path: (1) Recrudescence of infantile rickets
(2) Hunger osteodystrophy · famines

Clinic: All signs of infantile rickets except epiphysial changes in adolescents, whose diet lacks in Vitamin D

(C) Adult Rickets: Osteomalacia:

Def: Generalized extreme **decalcification of the skeleton** *with deformities from curvature or fracture* ***in*** **pregnant women,** debilitated by inadequate food, restricted freedom and prolonged lactation

Etio: (1) **Pregnancy and lactation**
(2) Inadequate diet: *avitaminosis*
deficient calcium
(3) Bad hygiene

Cause: (1) **D. avitaminosis**
(2) Deficient calcium intake: due to
(a) Deficient food
(b) Deficient absorption

Path: (1) **Decalcification** of osseous frame work
↓ (2) Fibrocellular metaplasia
(3) **Normal blood calcium and phosphorus**

Clinic: (1) **Pregnancy or Lactation: (repeated)**
(2) General: asthenia
(3) **Bone lesions:**
(A) Deformities: (as in rickets)
(B) Fractures
(C) X-Ray: Thin compact bone
Faint shadows

Compl: **Difficult parturition**

Treat: (1) **Calcium**
(2) **Vitamin D:**
(a) Dietetic: eggs, milk, butter
(b) Irradiated ergosterol
(3) **Cod-liver oil**
(4) **Ultra-violet exposures**

(2) SCURVY:

Etio: Age: between 3 and 18 months

Path: (a) **Vitamins C and D deficiency**
↓ (b) **Hæmorrhages** and hæmorrhagic extravasations

Clinic. (1) **Mucous membranes:** Hæmorrhages
(a) External
(b) Internal
(2) **Subcutaneous:** Hæmorrhagic extravasations
(3) **Bones:** (a) Subperiosteal hæmorrhages
(b) Separation of epiphyses
(4) **Joints:** Hæmarthrosis

Treat: **Vitamins C and D.**
(1) Vitamin C:
(α) Diet: **fruit juice**; cabbage; potato; cream
(β) Medicinal: cebion; cevitamic acid
(2) Vitamin D:
(α) Diet: eggs, milk, butter
(β) Medicinal: irradiated ergosterol

(B) RENAL DEFICIENCY DISEASES:

(1) RENAL RICKETS OR DWARFISM:

Etio. Juvenile nephritis

Path: Disturbance of Calcium metabolism due to nephritis (Calcium shortage)

Treat: (1) **Excision:**

Ind: (*a*) Displaced tendons & muscles
(*b*) Pressure on nerves, vessels, joints
(*c*) Bursitis
(*d*) Fracture
(*e*) Cosmetics

(B) **Flat Bones:**

Site: Pelvis; thorax; scapula; skull

Path: (1) **Ossifying:** In skull
(2) **Non-ossifying chondroma:** In pelvis

Clinic: Hard → fluctuating, **multilobular or multilocular swelling** fixed to the parent bone

Sp. Compl: (1) Mucoid degeneration
(2) Pressure signs
(3) Obstructed delivery
(4) Sarcoma

(C) ***Short long bones:***

Age. Children

Site: Central diaphysial in **metacarpals and phalanges**

Path: **Non-ossifying enchondroma**

Clinic: (1) Gradual, painless, noninflammatory, multiple **central expansions** of the bones of the hand
(2) *X-Ray: expansion with specks of calcification*

Diff. diag: (1) **T. B.** dactylitis
(2) **Syphilitic** dactylitis
(3) Osteoarthritis
(4) Tendon-sheath tumours; ganglion

Sp. Compl: (1) Pathological fracture

Treat: (1) Posterolateral incision → **curettage**
(2) Amputation

Secondary changes in chondromata

(1) Calcification
(2) **Ossification**
(3) **Mucoid degeneration**
(4) Necrosis
(5) Pathological fracture
(6) Malignant—sarcomatous degeneration

Complications of chondromata.

(1) **Cosmetic** deformities
(2) **Fracture**
(3) Friction
(4) Pressure
(5) Impairment of function
(6) Secondary change

Treatment of chondromata
- (1) Incision and **curette**: Enchondroma
- (2) **Excision**: Ecchondroma
- (3) Amputation: Multiple enchondromata

(3) OSTEOMA:

(A) **Cancellous: Ossified chondroma**

Site: Neighbourhood of **long bone metaphysis**
- (*a*) **Around the knee**: Femur, tibia, fibula
- (*b*) Humerus
- (*c*) Subungual

Path: **Ossified metaphysial ecchondroma**

Morb anat: (1) Adventitious bursa
- (2) Cartilage cap
- (3) Compact bone } continuous with parent bone
- (4) Cancellous bone } continuous with parent bone
- (5) Bone marrow } continuous with parent bone

Clinic: (1) **Bony out-growth** at the side of the end of a long bone
- (2) Appearance of one of the **complications**

Compl.: (1) Fracture
- (2) Bursitis
- (3) Pressure
- (4) Inconvenience

Treat: **Excision: After the joining of the epiphysis**

(B) **Compact or Ivory:**

Sites: **Bones developed from membranes:**
- (*a*) **Skull**: Parietal and Frontal
  - (α) Outer
  - (β) Inner
  - (γ) Air sinuses
- (*b*) **External auditory meatus**
- (*c*) **Jaws**

Path: Flat unpedunculated eburnated osteomas

Clinic: Irregular sessile hard bony tumours

Compl: Pressure signs

Diff. Diag: (1) Periosteal node
- (2) Ossifying sarcoma
- (3) Quiet necrosis
- (4) Odontome
- (5) Leontiasis ossea
- (6) Deep soft tissue growths and cysts:
  - Fibromata
  - Lipomata
  - Cysts

(4) DIAPHYSIAL ACLASIS: DYSCHONDRO-PLASIA

Synonyms: Multiple exostoses or osteochondromata
Etio: (a) **Hereditary and familial**
(b) **Childhood**
(c) **Boys**

Path: Theories: (1) **Keith:**
(a) Disturbance of endochondral ossification
↓ (b) Failure of bone modelling
(2) **Jansen:**
(a) Failure of limiting action of *periosteum at the metaphysis*
↓ (b) Failure of tubulation

Morb anat. (1) Multiple irregular outgrowths of cartilage and bone
(2) Failure of bone modelling at the metaphysis
(3) Deficient growth in the length of bones

Clinic: (1) **Multiple irregular exostoses** at the metaphysis *of long bones*
(2) Dwarfism
(3) *Deformities*
(4) X-Rays: irregular bone modelling
(5) ***History of heredity or familial occurrence***

Treat. Leave alone

(5) GIANT-CELLED TUMOUR OSTEO-CLASTOMA.

Etio: Sex: either

Age: 15–30 years (after the union of epiphyses)

Site (1) Lower extremity.
(a) **Upper end of the Tibia**
(b) **Lower end of the femur**
(c) **Upper end of the fibula**
(d) **Patella**
(2) Upper extremity
(a) Upper end of the humerus
(b) **Lower end of the radius**
(3) Mandible: myelomatous epulis

Path Origin: cancellous bone near ***metaphysis*** (affects only bones developed in cartilage)

Morb. anat: (1) **Giant cells (osteoclasts)**
+(2) Spindle cells
+(3) Vascularity
Honey-comb structure with maroon colour

Clinic: (1) Abrupt, painless, concentric **enlargement of a bone end with:**
(a) Signs of **increased vascularity**
(b) Eggshell **crackling**
(2) **X-Rays: Stippled or honey-comb** or multilocular appearance with thinning of the compact bone (soap bubble appearance) and a rock bottom edge

Diff. diag: (1) Osteomyelitis
(2) Osteoma
(3) Osteitis fibrosa
(4) Arthritis
(5) Aneurysm
(6) Sarcoma
} (A) **Bone lesions**
(B) **Joint lesions**
(C) **Vascular lesions**
(D) **New growths**

Compl: (1) Big size
(2) Pathological fracture (in 14%)

Treat. (1) Exposure→ **curettage**→ carbolization with pure phenol or 40% Zncl₂
(2) Wide **excision** with or without bone-graft
(3) Amputation
(4) Deep X-Rays

After-treat: Deep X-Rays

(6) DIFFUSE OR MULTIPLE MYELOMATOSIS: KAHLER'S DISEASE:

Etio. Age. **40–60 years**
Sex: Males
Sites: Skull, sternum, ribs, vertebræ, femur

Path: New growth of **plasma cells** of blood-forming marrow

Clinic: (1) **Multiple painful bone tumours**
or (2) Pathological fracture
(3) Enlarged spleen and liver (malignant metastases)
(4) **Bence-Jones albumosuria**
(5) Blood. increase in calcium and phosphorus
(6) X-Rays: clear punched out area in the bone

Compl: (1) Pathological fracture
(2) Pressure signs: cerebral
(3) Malignancy

Treat: **Deep X-Ray** therapy

(7) PLASMOCYTOMA:

(A) **Single:**

Sites: Long bones: humerus; femur

Path: **Mass of plasma cells**

Clinic: (1) **Pathological fracture**
(2) X-Ray: destruction + expansion + clear area

Diag: (1) No multiplicity
(2) **No Bence-Jones albumose**

Treat: Excision and bone-graft

(B) **Multiple:**

Clinic: (1) Multiple growths in bone
(2) No Bence-Jones albumose

(8) FIBROMA:
(1) Fibrous **epulis**
(2) Fibrous **odontome**
(3) **Periosteal** fibroma
(4) **Parosteal** fibroma
(5) **Fibrosarcoma** (malignant)

(9) SUB-PERIOSTEAL LIPOMA·

(B) MALIGNANT GROWTHS:

(1) SARCOMA·

Etio: Frequency: **30% of all sarcomas**
Age. **Second decade**
Sex: males

Site· Growing **metaphysis** of long bones
(*a*) Lower end of the **femur**
(*b*) Upper end of the **tibia**

Predisposer. (1) Trauma. fracture
(2) Bone disease. osteitis deformans
(3) Innocent tumours chondroma
myeloma

Pathology.
Varieties. (A) **Origin:**
(1) **Periosteal:** (*a*) Spindle celled
(*b*) Round celled
(2) **Endosteal:** (*a*) Spindle celled
(*b*) Round celled
(3) **Parosteal:** Fibrosarcoma from the outer layer of periosteum or aponeuroses
(4) **Ewing's:** Endothelioma
(5) **Secondary:** To benign growths: Chondroma

(B) **Cells:**
(1) **Round** celled
(2) **Spindle** celled
(3) **Mixed** celled
(4) **Giant** celled

(C) **Matrix :**
- (1) **Telangiectatic or angio-sarcoma**
- (2) **Chondrosarcoma**
  - (*a*) Primary
  - (*b*) Secondary (to chondroma)
- (3) **Osteosarcoma :**
  - (*a*) Irregularly scattered
  - (*b*) Radiating
  - (*c*) Periosteal lipping
- (4) **Fibrosarcoma**
- (5) **Myxosarcoma**

Origin : (1) **Periosteum :** Periosteal
(2) **Bone marrow :** Endosteal : malignant myeloma
(3) **Parosteal :** Outer layer of periosteum

Spread . (1) Endosteal : up and down the marrow
(2) Sub-periosteal : around the bone
(3) Extra periosteal : in the soft tissues

Secondaries . Blood : lungs

Clinic :

(A) **Local :**
- (1) **Painful type :** Localized persistent bony pain
- (2) **Vascular tumour type :**
  - (A) **Shape :**
    - (*a*) Gradual spindleshaped : endosteal
    - (*b*) Abrupt encircling . periosteal
    - (*c*) Discrete but adherent : parosteal
  - (B) **Consistency :**
    - (1) Hard : osteosarcoma , chondrosarcoma
    - (2) Fleshy : fibrosarcoma
    - (3) Soft : myxosarcoma
- (3) **Fracture type :** Pathological : non-union
  - (1) Early : endosteal
  - (2) Late : periosteal
- (4) **Periostitis or osteomyelitis type :** Ewing's tumour
- (5) **Metastatic type :**
  - (*a*) Lung symptoms
  - (*b*) X-Ray : 'Cannon ball' shadows
- (6) **X-Ray type :** Local sarcomatous picture in an unsuspected case

(B) **General:**
- (1) Cachexia
- (2) Fever
- (3) Anæmia

(C) **Referred: due to secondaries or pressure**
- (1) Lung signs
- (2) Pressure signs

Signs: (1) **X-Ray:**
- (*a*) **Osteoclastic:** Bony erosion without new formation
- (*b*) **Osteoplastic:** Irregular osseous mass
- (*c*) **Spiculation:** 'Ladder pattern'

(2) **Radiation:**
- (*a*) Therapeutic effect. Ewing
- (*b*) *Increased bone deposition in sarcoma*

(3) **Biopsy**

Diff. Diag: (A) **Bone affections:**
- (1) Trauma: callus, periosteal hæmorrhage
- (2) Inflammation. periostitis
osteomyelitis
- (3) Specific diseases: T. B
syphilis
- (4) Tumours & cysts

(B) **Joint affections:** Chronic arthritis

(C) **Muscle affections:** Myosarcoma
Gumma
Myositis ossificans

(D) **Vessel affections:** Aneurysm

Special features of different varieties:

(1) **Periosteal:**
- (A) **Tumour type:** Puberty,
Rapid growth,
Vascularity,
Abrupt encircling swelling
- ↓ (B) **Fracture type:** Late

(2) **Endosteal:**
- (A) **Painful type:** Localized persistent pain: early
- ↓ *(B) **Fracture type:** Pathological fracture: early*
- or (C) **Tumour type:** Small, spindleshaped central swelling: late

(3) **Parosteal: Tumour type:** Irregular submuscular hard mass secondarily adherent to bone
No bone erosion

(4) **Ewing: Inflammatory type:**

Etio: Age: **5-15 years**
Sex: Male
Site: (*a*) **Middle of the shaft of long bones**
Tibia; femur; humerus
(*b*) **Short bones**

Path: Origin: **Bone marrow** of mid part of diaphysis
Morb. anat: Picture of **osteomyelitis**
Microscope: Embryonic **round cells**
with
No intercellular matrix

Clinic: (1) History of recent trauma
(2) Pain
(3) **Pseudo inflammatory signs**
(*a*) Local: osteomyelitic or periostitic
(*b*) General: pyrexia with lecocytosis
(4) Metastases: bones; lymph glands; viscera
(5) X-Ray: (*a*) **Endosteal destruction:**
: Mottling of marrow
(*b*) **Subperiosteal ossification:**
: Widening and sclerosis of compact bone

Diff. diag: (1) **Chronic periostitis or osteomyelitis**
(2) Syphilitic or tuberculous osteomyelitis
(3) Multiple myelomata
(4) Bone secondaries

Diagnosis. **Therapeutic effect of deep X-Ray therapy**

Treat: **Deep X-Rays**

(5) **Telangiectatic Sarcoma:**
(A) **Vascular tumour type** } Pulsations and
(B) **Aneurysmal type** } vascularity

(6) **Chondrosarcoma:**

Etio: Sites: **Costal cartilages**
Ends of long bones

Clinic: (*a*) **Recurrence** after removal
(*b*) **Rapid growth**
(*c*) Local **infiltration**

(7) **Osteosarcoma:**

Clinic: (*a*) Hard bony tumour
(*b*) X-Ray: **Radiating spiculation**

Treatment of bone sarcomata:

(1) **Amputation:** Above the proximal joint
Ind: Sarcoma of main bone of a limb

(2) **Local Excision**: With bone-graft

Ind: (*a*) Adult age
(*b*) Long history
(*c*) Post-traumatic
(*d*) Useful limb after excision

(3) **Deep X-Ray therapy:**

Ind: (1) **Ewing's tumour**
(2) Post-operative
(3) Early cases

(4) **Coley's fluid**: B. Prodigiosus + Streptoc. erysipelatis half a minim intramuscular every day in gradually increasing doses

(5) **Radium**

Prognosis: Recurrence in viscera within a year to three years

(2) SECONDARY CARCINOMA

Methods of Extension:

(A) **Local Extension:**

(*a*) Rodent ulcer
(*b*) Lupus carcinoma
(*c*) Skin or mucous membrane carcinoma

(B) **Lymphatic extension**: (Sampson Handley)

(*a*) Permeation
(*b*) Embolism

(C) **Blood extension**: (Piney)

Primaries: which metastasize in bones:

The possibility of a carcinoma metastasizing in bones depends on the nature of the cell and the rate of growth therefore on the degree of malignancy. As a rule,

(i) a rodent ulcer does not metastasize

(ii) a squamous-cell carcinoma metastasizes in the regional lymphatic nodes

(iii) a columnar-cell carcinoma metastasizes in the regional lymphatic nodes, liver and lungs

and (iv) a spheroidal-cell carcinoma metastasizes in the regional lymphatic nodes, liver, lungs and bones

(1) **Breast:**

Site: (*a*) Local deposits.
Vertebræ, ribs, sternum, femur and humerus

(*b*) Generalized cancerous osteomalacia

(2) **Thyroid :**

Site : Skull, vertebræ, sternum

Clinic : (*a*) Very vascular

(*b*) Capable of function

: No myxœdema on total thyroidectomy

(3) **Hypernephroma :**

Site : femur ; sternum ; pelvis

(4) **Prostate :**

Site : Pelvis ; spine ; skull

Varieties : (*a*) **Osteoplastic**

(*b*) Osteoclastic

(5) **Bronchus**

(6) Suprarenals and testes

(7) Stomach-intestines rectum

(8) Bladder and uterus

(9) Tongue and œsophagus

(10) Melanoma malignum

Morb. anat : **Decalcification + destruction without new formation** (except in prostate)

Clinic : (A) **Local :**

(1) **Painful type :** Pain + tenderness

(2) **Tumour type :** Vascular swelling (thyroid)

(3) **Fracture type :** (Union occurs)

(4) **Deformity type :** Angular curvature in old age

(5) **X-Ray type :** Irregular bone destruction with no reaction

(B) **General :**

(1) Old age

(2) Cachexia

(C) **Referred :**

Primary growth present

Treatment : (1) **Deep X-Ray** therapy

(2) Radium

(3) Radical operation for the primary is contraindicated, though palliative measures may be carried out

(VIII) OPERATIONS ON THE BONES :

Indications : (1) Trauma

(2) Infections

(3) New growths

(4) Deformities

(1) EXPOSURES OF VARIOUS BONES:

(1) **Humerus**

(A) Upper ext: (a) Line of cephalic vein
↓ (b) Deltoid split

(B) Mid portion: (a) Deltoid insertion to ext. condyle
↓ (b) Brachialis split

(C) Lower ext: Posterior incision
↓ Triceps split:
(α) Division into superficial and deep portions
(β) Leave superficial portion attached to olecranon
(γ) Leave deep portion attached to humerus

Save: (1) Radial nerve
(2) Ulnar nerve

(2) **Radius:**

(A) Head and neck.
(a) Incision: vertical from ext. condylar tip
↓ (b) Common extensor split

(B) Upper third:
(a) Incision ext. epicondyle to ulna
(b) Common extensor split
(c) Supinator displacement

(C) Lower two-thirds.
(a) Incision along the medial border of brachioradialis

Save: (1) Radial nerve
(2) Radial artery

(3) **Ulna:**

(A) Coronoid.
(a) Incision. anterior
(b) Brachialis split

(B) Shaft Incision along the posterior border

(4) **Femur:**

(A) Upper part.
(1) Anterior route
(a) Incision: anterior third of iliac crest
↓ down along the sartorius
↓ (b) Separation of muscle origins

(2) Lateral route
(a) Goblet incision
↓ (b) Trochanter cut

(3) Posterior route
(a) Incision: parallel to gluteus max. ending beyond the trochanter
↓ (b) Gluteus maximus split

(B) Femoral Shaft:

(a) Incision: in the line of:

(α) Anterior superior iliac spine

to (β) Outer border of patella

↓ (b) Quadriceps split: between

(α) Vastus externus

and (β) Vastus intermedius

(5) **Tibia**
(6) **Fibula** } Incisions: parallel to and behind the subcutaneous borders

Save: External popliteal nerve: (upper part of fibula)

(7) **Patella:** (a) Incisions:

(1) Vertical anterior midline
(2) Curved: (a) convex down
(b) convex up

(2) OPERATIONS FOR FRACTURES:

Indications:

(A) **Local:**

(1) **Compound fracture**
(2) **Complicated fracture**
(3) **Persistent deformity:** Inspite of efficient skeletal traction
(4) **Separation of small processes**
(5) **Separation of epiphysis**

(B) **General:**

(1) Adult age
(2) Active occupation
(3) Weight bearing bones
(4) **Reliable asepsis** and technic

Common Sites: (1) **Skull:** (a) Compound fracture
(b) Local **depressed fracture**
(c) Gradual brain compression
(2) **Face: Persistent deformity**
(3) Humerus: (a) Persistent gross displacement
(b) Separation of bony processes
(4) **Both forearm bones: at one level**
(5) **Femur:** (a) **Neck**
(b) Separated condyles or trochanters
(c) Shaft with persistent deformity
(6) **Patella**
(7) **Olecranon**
(8) Unreduced Pott's fracture

Contraind: (1) Age: (a) below 15, (b) above 40
(2) Bad general health and constitutional disease
(3) Comminution and sepsis

Operative Procedures: (Also see under respective bone affections)

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(3) Comminution and sepsis

Operative Procedures: (Also see under respective bone affections)

(A) OPERATIONS FOR RECENT FRACTURES

(1) Transfixion

Ind: (1) Skeletal traction.
- (A) Direct mobile weight traction
- (B) Plaster incorporation traction

(2) Fixation of reduced fracture:
- (A) Fractures of long bones: femur, tibia, fibula, humerus:
  - with (a) Persistent displacement
  - (b) Comminution
  - (c) Sepsis
- (B) Deformity / Dislocation / Arthritis } of big joints (hip)

Methods. (1) Traction Pin: Steinmann
(2) Traction Wire: Kirschner
(3) Traction Callipers
(4) Traction Tongs

Sites.

(1) Femur: Indication. Fracture shaft
Site. Two fingers breadth above the most prominent part of condyles
Compl: (a) Stiff knee
(b) Sepsis: bone or joint

(2) Tibia:

(A) Upper end Indication: (a) Fracture femur
(b) Fracture femur with sepsis
(c) Fracture lower end of the femur
Site: three-fourth inch below and behind the tibial tubercle

(B) Lower end Ind: Fractures tibia and fibula
with (a) Displacement
(b) Comminution
(c) Sepsis
Sites: (1) Three inches above the ankle
(2) Through the malleoli

(C) Upper and lower combined:
Ind: Fractures both the bones of the leg
Plaster incorporation method

(3) Os calcis: Ind: (a) Fracture through ankle joint
(b) Fractures lower end of tibia and fibula
Sites: (1) One finger breadth below and behind the tip of external malleolus
(2) Above the posterior process of os calcis in front of tendo achillis

(4) Olecranon: Ind: Fracture lower end of the humerus
with: (*a*) Displacement
(*b*) Comminution
(*c*) Sepsis

After-treat: (1) Weight extension
or (2) Incorporation in Plaster-of-Paris

Complications: (1) Overtraction → non-union
(2) Undertraction → persistent deformity
(3) Injury to: joints, vessels, tendons
(4) Infection: (*a*) Bone
(*b*) Joint
(*c*) Skin
(5) Cutting out of the pin
(6) Skin sores

(2) Coaptation with or without impaction

Ind: (1) Fracture at the junction of shaft with extremity
: Surgical neck of humerus
(2) Fracture radius

Tech: (1) Exposure of the fragments
(2) Removal of intervening callus and soft tissues
(3) Preparation of the ends
(4) Coaptation with or without impaction
(5) Soft tissue sutures

After-treat: Plaster-of-Paris

(3) Plating with (*a*) Screws
(*b*) Bolts

(A) With screws:

Ind: (1) Transverse fractures of the long bone shafts
: Femur; tibia; radius
(2) Y Fractures into the joints
: Elbow, knee

Contraind. (1) Children
(2) Sepsis
(3) Oblique fractures

Tech: (1) Incision: ⅔th of the length of the bone
(2) Exposure of the fragments
(3) Manipulative coaptation of the fragments
(4) Fixation of the fragments by bone forceps
(5) Application of the plate: subperiosteal
(6) Screws: three on each side
(1) Femur: After-treat: Thomas' splint
Massage and movements: after two weeks
Weight bearing: after twelve weeks
(2) Humerus: After position: moderate flexion of elbow
(3) Forearm bones: Plate the radius only
Fixation in mid position

(D) Catgut: chromic
(E) Fascia Lata

Sites:

(A) Olecranon:

Ind: Recent fracture with separation

Tech: (1) Incision: U
(2) Exposure and toilet of the fragments
(3) Drilling the fragments
(4) Wirelooping
(5) Setting the fracture and tightening the loop
(6) Suture of the triceps aponeurosis

After-treat: (1) Sling with flexion of the elbow: for 4 weeks
(2) Movements: from the 3rd day
(3) Use of hand from the 3rd week

(B) Patella:

Methods:

(1) Wiring
(2) Suturing
(a) Kangaroo tendon
(b) Silk
(c) Chromic catgut
(d) Fascia

Ind. Transcapsular avulsion fracture with separation

Time. Within the first week

Tech: (1) Incision: U or ∩
(2) Exposure and toilet. (a) Fracture
(b) Joint
(3) Drilling: (a) Anteroposterior
or (b) Side to side
(4) Setting the fracture
(5) Passing the wire or suture: (a) Anteroposterior
or (b) Side to side
(6) Suture of the aponeurosis

After-treat of: (A) Wiring. Flexion over a pillow
Movements. from 4th day
Weight bearing. from 3rd week
(B) Suturing Plaster-of-Paris fixation: for six weeks
(3) Fascial encirclement

Tech: (1) External J incision
(2) Fascia lata strip: with lower attachment intact
(3) Encirclement:
: through quadriceps tendons
↓ inner side
↓ through ligamentum patellæ
↓ head of the fibula (lower attachment)

Advantages (1) Living suture
(2) New insertion for quadriceps

(B) OPERATIONS FOR MALUNION:

(A) ANGULAR DEFORMITY:

(1) Simple osteotomy:

Def: Division at the site of deformity and readjustment in alinement

Ind: Upper end of the femur

Tech: (1) Incision: local one inch
- (2) Exposure of the bone
- (3) Elevation of periosteum
- (4) Osteotomy: for two-thirds of the bone thickness
- (5) Manual osteoclasis
- (6) Readjustment
- (7) Closure

After-treat: (A) Femur: (a) Plaster-of-Paris: for 6 weeks
- (b) Walking calliper: for 6 months
- (B) Tibia: (a) Plaster-of-Paris: for 4 weeks
  - (b) Plaster with side irons: for 4 months

(2) Cuneiform osteotomy:

Def: Removal of a wedge from the convexity and readjustment of alinement

Ind. Tibia: after Pott's fracture

Tech: Angle of the wedge must be equal to angle of the convexity

(3) Curved osteotomy: Supracondylar

Ind: Flexion deformity of the knee

Tech: (1) Lateral supracondylar incisions
- (a) inner
- (b) outer
- (2) Curved saw cut three inches above the knee
  - (a) anteroposterior
  - (b) convexity downwards
- (3) Adjustment of alinement
- (4) Plaster fixation

(4) Bifurcation osteotomy: (See under nonunited fracture femoral neck)

Ind: (1) Adduction deformity of the hip: coxa vara
- (2) Ununited fracture of the femoral neck

Tech: (1) Supra-trochanteric (minor) osteotomy
- (2) Inward displacement of the shaft
- (3) Abduction: (to umbilicus) + Impaction: (to pelvis) } of the thigh
- (4) Plaster-of-Paris fixation for 3 months

(B) SHORTENING: OVERLAPPING:

(1) Recent: (a) Refracture
- ↓ (b) Skeletal traction

(2) Intermediate: (a) Exposure
- ↓ (b) Resetting
- ↓ (c) Fixation

(3) Late: (a) Z osteotomy
↓ (b) Traction
↓ (c) Bone wedges
↓ (d) Fixation

(C) OPERATIONS FOR NON-UNION

(1) **Multiple drillings:** For delayed union
(2) **Freshening the fragments:** And
(a) **Coaptation**
(b) **Impaction**
(c) **Stepcut fixation**
Ind: Humerus
Both forearm bones
(d) **Double-cone:**
: Mutual adjustment of the shape of the fragment ends
(3) **Bone-graft:**
Methods: (A) **Massive Grafts**
(1) **Onlay**
(2) **Inlay:** Diamond; simple; sliding; double
(3) **Intramedullary:** Simple; cricket-bail; double
(4) **Terminal**
(B) **Small graft**
(1) **Bone nails**
(2) **Bone chips**
(3) **Matti method**
(C) **Mixed grafts**
Ind: (1) **Ununited fracture**
(a) With no loss of bone
(b) With loss of bone
(2) **Loss of bone:** Due to
(a) Trauma
(b) Osteomyelitis
(c) Excision
(3) **Stabilization of joints:** Arthrodesis

Functions of the graft:
(1) Strut formation
(2) Osteoconductive
(3) Osteoformative

Sources: (1) Hetero: (a) Ivory
(b) Beef
(c) Antler
(2) Homo. (Same blood group)
(3) Auto: (1) Living
(2) Boiled

Sites: (1) Shaft of the tibia: for spine, hip
(2) Shaft of the fibula: for humerus or femur
(3) Ribs
(4) Pelvic crest: for jaw
(5) Free fractured fragment

Preliminaries: (a) Good general health
(b) Three months after healing
(c) Treatment of marked deformity

Stage I: Host bone:
(1) Exposure
(2) Excision of scar tissue or callus
(3) Freshening of the bone ends
(4) Preparation of graft bed

Stage II: Bone-graft:
(A) Massive graft

Tech: (1) Incision
(2) Separation of soft tissues
(3) Division of periosteum
(4) Separation of graft: from any suitable site
(5) Placing the graft on bed
(6) Fixation: catgut, kangaroo; wire
(7) Suture of soft tissues

After-treat: Plaster fixation for 3 months

Methods of massive grafts:

(1) Onlay Laying and fixing the graft over the surface of the host bone
(2) Inlay · Laying and fixing the graft in a bed cut on the surface of the host bone
(a) Cortical inlay:
Ind. Non-union without gap
Tech: (1) Preparation of bed for graft
(2) Separation of the graft
(3) Placing the graft in the bed
(4) Fixation of the graft
(b) Sliding inlay: Grafts out of the surfaces of the fragments long one bridging the fracture
(c) Double inlay:
Ind: Gap fracture or non-union of femur
Tech: (1) Freshening the fragment ends and contact
(2) Bed on either side
(3) Two grafts from tibia
(4) Placing the grafts in beds
(5) Fixation with bolts
(3) Intramedullary:
(a) Simple:
Ind: (1) Transverse fracture of long bone: femur, humerus, radius
(2) Gap fractures of long bones

Tech: (1) Exposure and freshening the ends
(2) Drilling the medullary cavity of fragments
(3) Cutting the graft
(4) Insertion of the graft in the medullary cavity

(b) Cricket ball:
Ind: Gap fractures of tubular bones: radius
Tech: (1) Graft: 4" x ¾" x ½" with two ends sharp
(2) Isolation and freshening of two fragments
(3) Splitting the end of one fragment
(4) Put the graft first in unsplit end and then in the split end

After-treat: Fixation:
in: Elbow flexed
Forearm supinated
Wrist dorsiflexed
by: Plaster-of-Paris

(c) Double or two piece:
Ind. Gap in the shaft of long bones: humerus
Tech: (1) Two flat grafts with peg handles
(2) Pegs in respective fragments
(3) Grafts wired together
After-treat: (1) Abduction splint
↓ (2) Abduction plaster

(4) Terminal:
Ind: Replacement of articular end of a long bone
(A) Humeral head
(B) Radial lower end
(C) Femoral head and neck
Tech: (1) Preparation of the bed.
: Excision of host extremity
(2) Preparation of the graft:
Excision of the head & upper shaft of fibula
Tech: (a) Incision
(b) Exposure and separation of fibular he and neck
(c) Fixation of biceps and lateral ligament to til
Save: Ext. popliteal nerve
(3) Drive the graft into the host shaft

(B) Small Grafts
(5) Bone Nails
Ind: (1) Ununited fracture near an extremity of a long bone
(2) Separation of processes, trochanters, tubercles
(A) Humerus: (a) Neck
(b) Lower end
(B) Ulna: upper end
(C) Femur: (a) Neck
(b) Subtrochanteric
(D) Os calcis: posterior process

Tech: (1) Peg shaped graft
(2) Drilling both the fragments after reduction
(3) Driving in the bone peg

(6) Bone Chips:

Ind: (1) Nonunion without gap
(2) Availability of chips on the spot

Tech: (1) Exposure
(2) Excision of callus and separated comminuted fragments
(3) Guttering of both the fragments
(4) Apposition of the fragments
(5) Filling in the cavity with bone chips
from: (a) freshened guttered fragments
(b) callus
(c) iliac crest or rib

After-treat: Splint for 10 days → plaster cast

(7) Matti Method·
As in (6)
Semifluid medullary material from greater trochanter to be used in addition to bone chips

(C) Mixed Grafts:
Mixture of any two or more of the above methods
Inlay combined with intramedullary

Ind: Gap fractures below surgical neck of humerus

Tech: (1) Exposure and excision of callus or scar
(2) Preparation of bed
(a) Drill the upper fragment marrow
(b) Cortical bed in lower fragment
(3) Graft from tibia
(a) Round upper half
(b) Flat lower half
(4) Placing the graft:
(a) Pegging the upper fragment
(b) Inlay graft in lower fragment
(5) Fixation by wire loop: lower inlay graft

After-treat: (1) Internal angular splint: for 10 days
↓ (2) Fixation:
in: Shoulder: abducted
Elbow: flexed
Wrist: dorsiflexed
Hand: to the chin
by: Plaster-of-Paris

Complications of bone graft:
(1) Graft falling on the floor: (a) Reject
(b) Boil
(2) Sepsis:

After-treatment of bone graft:
(1) Splint immobilization for 10 days: sutures out
↓ (2) Plaster-of-Paris immobilization
: Till union is complete

(3) OPERATIONS FOR OSTEOMYELITIS

(A) ACUTE OSTEOMYELITIS:

(1) Periosteal drainage

Ind: (1) **Septicæmic stage**
(2) Sub-periosteal accumulation

Tech: (*a*) Tourniquet
(*b*) Incision:
(α) Femur: outer side
(β) Tibia: inner side along posterior border
(γ) Humerus: through the deltoid
(δ) If abscess: along the abscess
(*c*) Exposure of the bone
(*d*) Periosteal incision
(*e*) Drainage of sub-periosteal pus

↓ (2) **Starr's operation: (A) Periosteal incision + (B) Multiple drilling or trephining**

Ind: (*a*) No sub-periosteal pus
(*b*) **Non-amelioration of signs within 24 hours of periosteal drainage**

Tech: (1) As in periosteal drainage
(2) Multiple drills or trephinings into the bone marrow
(3) Drainage upto the bone

↓ (3) **Metaphysial drainage: Saucerization**

Ind: **Thick pus welling out of trephine hole**

Tech: (1) As in periosteal drainage
(2) Saucershaped bone gouging: 1·5" x ·75"
(3) Antisepsis:
(*a*) Rectified spirit lavage
(*b*) Acriflavine lavage
(*c*) Flavine-Paraffin-Vaseline pack

After-treat: (A)
(1) **Elastoplast or adhesive extension**
On a Thomas's splint
(2) Removal of pack on the 7th day under general anæsthesia
(3) Subsequent dressings at 5 days intervals

or (B) **Plaster-of-Paris fixation**
extent: Joint above and below
for: 6–8 weeks

(B) SUBACUTE OR CHRONIC OSTEOMYELITIS

(4) **Diaphysial drainage: Gutter operation**

Def: Sub-periosteal removal of compact tissue of half or more of the circumference over the infected area

Ind : (1) **Medullary osteomyelitis**
(2) Metaphysial → medullary osteomyelitis
(3) Subacute or **chronic** osteomyelitis

Tech : (1) As in saucerization
(2) *Removal of half to one-third of the circumference by chisel*
(3) Gentle scraping of the bone marrow
(4) Antiseptic applications : as in saucerization

After-treat : Winnett orr

(5) Sub-periosteal resection of the diaphysis

(A) Total

(B) Partial

Ind : (1) **Separation of whole shaft**
(2) Subacute or chronic stage
(3) Non-important bone : clavicle, ulna, fibula

Tech : (1) As in periosteal incision
(2) Cut the shaft midway
(3) Twist off each half
(4) Antiseptic applications
(5) Drain

After-treat : Winnett orr

(6) Sequestrotomy

Def : Removal of the dead separated piece of bone by cutting through the ensheathing involucrum

Time : (1) **Two months after acute stage**
(2) **Thin parchment like involucrum** : needle prick test
(3) **Mobile sequestrum** : Probing
(4) **X-Ray** : Separated sequestrum

Tech : (1) Incision including the sinuses
(2) Separation of soft tissues
(3) Elevation of periosteum
(4) Enlargement of cloacæ
(5) Removal of sequestrum
(6) Sterile vaseline pack

After-treat : Winnett orr

(7) Secondary operations for persistent cavity

after : (*a*) **Sequestrotomy**
(*b*) **Gutter operation**
(*c*) **Diaphysectomy**

(1) Muscle pedicle flap
(2) Bone-grafting : (1) Massive
(2) Chips
(3) Matti

IMPORTANT POINTS

(1) Metaphysis is the most important part in pathology of bone; next is the periosteum

(2) In all cases of metabolic diseases of bones leading to deficient calcium, the X-Ray shadows are very hazy and may give an impression of badly developed film: as in (a) Rickets
(b) Osteomalacia

(3) Fractures with special names: (See under respective bones)
- (a) Colles': Lower end of the radius—Dinner fork deformity
- (b) Smith's: Lower end of the radius [Reverse of (a)]
- (c) Chauffeur's: Lower end of the radius
- (d) Bennett's: Base of the first metacarpal
- (e) Punch: Shaft of the second metacarpal
- (f) Kocher's: Pertrochanteric femoral
- (g) Pott's: Round about ankle
- (h) Dupuytren's: Round about ankle
- (i) Wagstaffe: Round about ankle
- (j) *March: Second or third metatarsal necks*

(4) Average periods of disabilities in fractures

Bone	*Light work*	*Heavy work*
Clavicle	5 weeks	8 weeks
Humerus	15 weeks	24 weeks
Colles'	6 weeks	12 weeks
Femur	30 weeks	40 weeks
Tibia	18 weeks	22 weeks
Both leg bones	*20 weeks*	*30 weeks*
Pott's	10 weeks	30 weeks

(5) Special complications of special fractures
- (1) Skull: Intracranial complications
- (2) Face: (a) Sepsis
  - (b) Deformities
- (3) Spine (1) Paralysis: (a) Muscular
  - (b) Urinary
  - (c) Intestinal
  - (d) Respiratory
  - (2) Trophic changes
  - (3) Secondary sepsis
- (4) Round about shoulder joint:
  - (1) Injury to vessels and nerves
  - (2) Adhesions
  - (3) Osteoarthritis
  - (4) Mal-union

(5) Middle of the humerus
  (1) Radial palsy
  (2) Non-union

(6) Round about elbow:
  (1) Nerve injuries: ulnar & radial
  (2) Vessel injuries: gangrene
  (3) Muscle affections:
    (a) Volkmann
    (b) Myositis ossificans
  (4) Joint: ankylosis
  (5) Deformities: cubitus varus or valgus

(7) Both bones forearm: cross union

(8) Round about wrist:
  (1) Weak wrist
  (2) Overlooked fracture navicular
  (3) Deformity
  (4) Adhesions and ankylosis
  (5) Osteoarthritis
  (6) Tenosynovitis
  (7) Rupture extensor pollicis longus

(9) Pelvis: visceral trauma: urethra
  bladder
  rectum

(10) Femur: (1) Mal-union: (a) Coxa vara
  (b) Shortening
  (2) Hip joint: (a) Ankylosis
  (b) Osteoarthritis
  (3) Knee joint: osteoarthritis

(11) Round about knee:
  : (1) Ankylosis knee
  (2) Osteoarthritis knee
  (3) Popliteal aneurysm
  (4) Deformity

(12) Neck of the fibula
  : Paralysis common peroneal nerve

(13) Round about ankle
  : (1) Deformities: Flat foot
  Varus
  Valgus
  (2) Osteoarthritis ankle

(14) Metatarsals: (1) Flat foot
  (2) Metatarsalgia

(15) Bony processes and sesamoid bones:
  (1) Non-union
  (2) Callus formations
  (3) Myositis ossificans

(16) Near-about joints : (1) Adhesions
(2) Osteoarthritis

(6) If there is a localized bone tenderness after a trauma, fracture must be assumed until disproved by X-Ray.

(7) In every case of fracture, diagnosis is not complete till examination for the injuries to neighbouring soft parts is completely done: (*a*) vessels; (*b*) nerves; (*c*) tendons; (*d*) joints; (*e*) viscera; (*f*) special structures.

(8) No attempt should be made to reduce a fracture displacement, until good X-Ray films or X-Ray screen are available.

(9) It is better to have no X-Ray at all than to rely on one film

(10) If a radiograph fails to show any evidence of fracture, which is strongly suspected on clinical grounds, the X-Ray examination should be repeated after two or three weeks, when a crack is exaggerated due to traumatic hyperæmic decalcification

(11) Differential diagnosis between

(A) Dislocation shoulder: from: Fracture humeral neck

Dislocation shoulder	Fracture humeral neck
(1) Hollow under acromion.	(1) Full shoulder
(2) Head in abnormal situation.	(2) Head normally situated
(3) Head moves with shaft	(3) Head independent of shaft
(4) Arm cannot be placed on chest.	(4) Arm can be placed on chest

(B) Dislocation elbow: from: supracondylar fracture

Dislocation elbow	Supracondylar fracture
(1) Abnormal bony relations:	(1) Normal bony relations
(2) Mobility less due to locking:	(2) Mobility more

(C) Sprained wrist: from: Colles' fracture

Sprained wrist	Colles' fracture
(1) No deformity:	(1) Elevation of radial styloid
(2) No bone tenderness:	(2) Bone tenderness

(D) Sprained wrist: from: fracture scaphoid

Sprained wrist	Fracture scaphoid
(1) Normal anatomical snuff box:	(1) Anatomical snuff box tender and swollen
(2) Cle[illegible] ten days:	(2) Chronicity

(E) Trau[illegible] hip: f[illegible] femoral

(1) Lo[illegible] history
(2) F[illegible] over tr[illegible] jar[illegible]

(3) F[illegible]

(F) **Sprained ankle : from : Pott's Fracture :**

(1) Tender external lig. : (1) Tender internal lig.
(2) Pain on inversion : (2) Pain on springing the fibula

(12) Following fractures are noted for slow union due to deficient blood supply :

(1) Shaft of the humerus
(2) Lower third of the ulna
(3) Lower third of the tibia
(4) Neck of the femur
(5) Carpal scaphoid

(13) Following fractures are noted for non-union due to inadequate immobilization :

(1) Carpal scaphoid . shearing
(2) Ulnar shaft : rotation
(3) Humeral shaft : rotation
(4) Tibial shaft : rotation
(5) Femoral neck : shearing + rotation
(6) Plated fractures

(14) Following fractures fail to unite due to interposition of soft parts :

(1) Ulnar styloid
(2) Patella
(3) Internal humeral epicondyle
(4) Tibial tubercle

(15) Assuming there is a continuous hæmatoma between the fragments, there is only one cause of non-union and that is failure of adequate immobilization :

(a) Inadequate immobilization
(b) Immobilization for inadequate period

(16) Following fractures unite however treated :

(a) Fracture clavicle
(b) Fracture lower end of radius
(c) Fracture rib

(17) There is no fixed period of immobilization in a fracture. A fracture must be immobilized till there is a complete clinical and radiographical union. Interference merely in response to the dictates of a calender is disastrous.

(18) Constant movements of fragments upon one another lead to pseudarthrosis especially in :

(a) Ill-nourished intra-articular bones :

(1) Femoral neck
(2) Navicular

(*b*) Transverse fractures
 (1) Lower third of tibia
 (2) Mid third of radius

(19) Fractures near the joints *which are surrounded by short fibred* muscles passing only over one joint have a tendency to myositis ossificans and abundant callus formation:
 (1) Sub and pertrochanteric femoral fractures
 (2) Elbow fractures

(20) Quadriceps drill must be done every two hours for five minutes in every case of immobilization of lower extremity.

(21) Every joint which does not need to be immobilized must be actively exercised from the first day of injury.

(22) Relaxation of knee ligaments is directly proportional to the wasting of the quadriceps and does not depend on the site of traction. It recovers fully when the tone of the thigh muscles is regained.

(23) If continuous traction is required for a fracture of the leg bones, the pin should be inserted through the lower shaft of the tibia about two inches above the ankle joint.

(24) Metallic foreign bodies should not be used in fractures of:
 (*a*) Olecranon
 (*b*) Humeral condyles
 (*c*) Tibial tuberosities
 (*d*) Patella

(25) In every fracture or dislocation, test all the nerves going past the site.

(26) A B.C. of fracture treatment:
 (A) Reduction: correction of displacement under x-ray
 (B) Immobilization : complete and uninterrupted
 : till union is complete
 (C) *Functional activity*: *active daily exercises of joints which need not be immobilized*

(27) Hyperæmia of bone is always associated with decalcification and ischæmia with sclerosis.

(28) The pain of fracture is forgotten but not the pain of cutting open a plaster.

(29) Fractures where traction treatment is necessary
 (A) Upper limb: (1) Bennett's fracture dislocation
 (2) Phalanges
 (3) Shaft of the radius
 (4) Neck of the humerus

(B) Lower limb: (1) Every fracture of femoral shaft
(2) Unstable fracture of tibia & fibula

(30) Primary minimum requirements of operative treatment of simple fractures:

(1) 48 hours skin preparation
(2) 10 minutes hand scrub
(3) Exclusion of the skin
(4) No-touch technic
(5) Reliable staff (for asepsis)

(31) Indications for operative reduction of fractures are:

Fractures of (1) Patella
(2) Olecranon
(3) Humeral epicondyle
(4) Internal malleolus
(5) Femoral neck

(32) Internal fixation must always be supported by external fixation, failing which, non-union is sure to follow.

(33) Splints in common use for fractures:

(A) Upper limb: (*a*) Thomas' arm splint
(*b*) Robert Jones'

(B) Lower limb: (*a*) Thomas' knee splint
(*b*) Braun's splint

(34) Indications for operative treatment of fractures

(A) Immediate:

(1) Complicated: (*a*) Rupture or pressure on main vessels
(*b*) Injury to vital viscera

(2) Compound: (*a*) Debridement (within 12 hours)
(*b*) Winnett orr (after 12 hours)
(*c*) Amputation (in bad cases)

(B) Intermediate:

(1) Complicated: (*a*) Injury to a joint
(*b*) Injury to a nerve
Ind: (*a*) Joint sepsis
(*b*) Total paralysis persistent after two weeks

(2) Persistent mal-position inspite of:
(*a*) Efficient traction
(*b*) Repeated manipulations

(3) Fractures of small bones or bony processes:
: Patella; olecranon; epiphysis

(4) Septic fractures: drainage

(C) Remote:

(1) Septic fracture with general health deterioration
(2) Late complications:
    (a) Myositis fibrosa or ossificans
    (b) Neuritis fibrosa
    (c) Aneurysm
(3) Mal or non-union
(4) Sepsis: sequestrotomy

(35) *Finger exercises are of prime importance in the treatment of* all forearm fractures.

(36) An open or compound fracture is a surgical emergency no less urgent than acute appendicitis or duodenal perforation and must be as urgently operated upon under general anæsthesia.

(37) Never introduce foreign material including catgut sutures or ligatures in the treatment of compound fractures.

(38) Primary debridement of an open fracture is contraindicated:
(1) After 24 hours of occurrence
(2) Profound shock

(39) In primary treatment of open fractures:
Avoid. (1) Internal fixation
(2) Foreign sutures and ligatures
(3) Unpadded plaster cast

(40) Most fractures of the body of the mandible are compound in the mouth. Irregularity in the line of the teeth is the most important sign

(41) In fractures of the clavicle, especially in patients over 40 there is only one real danger:
(Stiff fingers and a stiff shoulder

(42) Complication of fracture scapula or fractures round about shoulder is ankylosis of shoulder.

(43) Most common shoulder injury in children is an adduction fracture of the neck of the humerus.

(44) Most common of all the shoulder injuries is the abduction fracture of the *surgical neck of the humerus*

(45) An abduction fracture of the surgical neck of the humerus [illegible] position, unless continuous [illegible] n abduction frame in [illegible]

(46) An adduction fracture of the anatomical neck of the *humerus* is treated on an abduction frame.

(47) Supracondylar fractures, one of the commonest injuries of children and adolescents, is seldom sustained after the age of 20.

(48) Fracture of lateral humeral condyle in children leads to non-union; ordinary supracondylar fracture leads to ankylosis.

(49) Manipulative technic in supracondylar fracture of humerus (in the common type): traction → flexion → lateral compression.

(50) Immobilization of elbow in extension:

(1) Fracture olecranon: after manipulative reduction
: anterior slab

(2) Supracondylar fracture:
: with forward displacement of distal fragment
: posterior slab

(3) Intercondyloid T or Y fracture

(4) Separation of humeral metaphysis

(5) Forward dislocation of the elbow

(6) Fracture both bones in the upper third of forearm.

(51) Avulsion of internal epicondylar epiphysis by traction of common flexor origin in valgus strains of the joint is one of the commonest injuries of the adolescents.

(52) Fracture head of the radius may lead to permanent limitation of extension of elbow due to impact injury of the capitellum

(53) A fall on the outstretched hand, which impacts the head of the radius against the capitellum, is the cause of:

(a) Fracture radial head: in adults

(b) Separation radial epiphysis. in children.

(54) If there is a fracture of one forearm bone with overriding or angulation, and there is no fracture of the other bone, there must be a dislocation of one of the radio-ulnar joints.

(55) Fractures of the radius

(A) Upper third: immobilize in full supination

(B) Middle third }
(C) Lower third } immobilize in mid position.

(56) The most common cause of failure in the treatment of Colles' fracture is an imperfect correction of the radial displacement.

(57) Provided the finger exercises are done regularly, the wrist joint takes care of itself even in plaster.

(58) Exercises for every case of upper limb fracture:

(A) Shoulder: (1) Full abduction
(2) Full eversion
(3) Full inversion

(B) Fingers: (1) Full extension
(2) Full abduction
(3) Full flexion.

(59) In fracture of both the bones in the forearm, the plaster must extend from metacarpal heads to shoulder until union is complete as shown by X-Rays.

(60) No fracture is more commonly overlooked and no failure of diagnosis is penalized by non-union with greater certainty than the fracture of carpal scaphoid. Every patient who injures the wrist and is tender on the radial side must be assumed to have a fracture of the scaphoid until repeated radiographic examinations prove otherwise.

(61) Union of carpal scaphoid is not sound until radiographs show complete obliteration of the line of fracture seen in: (a) Anteroposterior film
(b) Lateral film
(c) Oblique film
(d) Delayed film

(3 weeks after removal of plaster).

(62) Treatment of fracture scaphoid:
(1) Recent: fixation in dorsal plaster cast
(2) Delayed union: prolonged plaster fixation
(3) Non-union: (a) Multiple drilling
(b) Bone-graft
(4) Avascular necrosis: excision
(5) Arthritis wrist: arthrodesis wrist.

(63) Forcible passive movements lead to permanently stiff fingers.

(64) Thumb is equal to half of the hand and should never be amputated unless absolutely unavoidable.

(65) Fracture of the neck of the fifth metacarpal is the second commonest fracture in the hand.

(66) Each finger in the flexed position points to the tubercle of the scaphoid and should be immobilized in that position in fractures of the proximal phalanx.

(67) Every elderly patient who after slight injury to the hip complains of pain or is found to lie with the limb in external rotation, must be assumed to have sustained a fracture of the neck of the femur. X-Ray must be insisted in all hip injuries which do not clear up within ten days.

(68) Classification of the femoral-neck fractures :

(A) Abduction : Impacted subcapital : 'Latent'

(B) Adduction : (a) Subcapital
(b) Transcervical
(c) Intertrochanteric } Basal.
(d) Pertrochanteric }

(69) Reducion of fracture neck of the femur :
Traction → Internal rotation → Abduction.

(70) Thomas' knee splint is never excelled as a first aid treatment of lower limb fractures.

(71) Non-union is rare while mal-union is most common after fractures of the shaft of the femur.

(72) Operative exposure of the femoral shaft is followed by the danger of quadriceps adhesion.

(73) The only treatment necessary for a good union of femoral shaft is continued, uninterrupted and efficient immobilization.

(74) Before manipulating a stiff knee joint under anaesthesia be sure that :
(a) Patella is not ankylosed to the femoral condyles
(b) Quadriceps is not fixed to the femoral shaft.

(75) Normal length of the lower extremity can easily be maintained by skin traction, even in strong men with powerful muscles, if the Thomas' splint is tied to raised foot of the bed.

(76) Common deformity of fracture femoral shaft :
(1) Eversion
(2) Shortening
(3) Lessening of anterior curve.

(77) See that the buttocks are off the bed in Gallows suspension method (in children).

(78) Fractures involving the continuity of femur give rise to shortening of the limb due to less distance between anterior superior iliac spine and the adductor tubercle, shortening being above the trochanter major in cases of neck fractures.

(79) Indications for various procedures in fracture femur :
(1) Sand bags : very old patients with chest affections
(2) Thomas' hip splint with callipers } : senile debilitated patients
(3) Plaster-of-Paris : (A) Fracture femoral neck
(B) Fracture restive people
(C) Post-operative

(4) Gallows suspension: children upto six years

(5) Thomas' knee splint: (1) Age between 5 and 15
(2) Shaft fracture without much displacement

(6) Traction: all complete shaft fractures in adults:
(A) Adhesive: (a) Slight displacement
+(b) Weak muscles
(B) Skeletal: (a) Much displacement
+(b) Strong muscles
(c) Septic wounds
(d) Comminution

(7) Operation: (a) Persistence of deformity inspite of one week's pin extension
(b) Fractures of processes or neck.
(c) Compound fractures
(d) Complicated fractures
(e) Abnormal union.

(80) Special features of fracture lower femoral end:
(1) Involvement of knee joint
(2) Pressure on popliteal vessels
(3) *Complications*: (a) *ankylosis knee*
(b) deformity
(c) *osteoarthritis knee*

(81) *Only about 50% of cases treated by Whitman method give* bony union:
(1) Intra-capsular fracture ends in non-union
(2) Impacted abduction fracture (latent) unites by Whitman.

(82) Pauwel's grouping of fracture femoral neck:
(1) Horizontal: good prognosis: no operation
(2) 30°–50°: nailing
(3) Vertical: bad prognosis: nailing + pegging.

(83) After operative treatment of fracture femoral neck, the period before weight bearing is allowed should not be less than six months (X-Ray evidence).

(84) In most cases of ununited fractures of femoral neck, the line of fracture is 50° or more from the horizontal.

(85) The routine method of *setting and fixing the femoral fractures* should be by the use of 'traction + external splinting'. If accurate reduction cannot be obtained: '*open reduction* + transfixion pin fixation + incorporation in plaster-of-paris'.

(86) Methods of internal and external fixation should be made allies and not rivals in *difficult fractures*.

(87) Supracondylar skeletal traction gives rise to:
- (a) Permanent stiffness of the knee
- (b) Infection: osteomyelitis or arthritis.

(88) Plaster spica is unsuitable for recent fractures of the femoral shaft, as it does not prevent backward angulation of the fragments.

(89) In fracture patella:
- (A) Suture: young adults
- (B) Excision: (a) Middle-aged and elderly
  - (b) Severe comminution.

(90) Differential diagnosis of fracture patella is:
Congenital bipartite patella: bilateral.

(91) Penalty of complete stiffness is more serious in knee joint than in any other joint of the lower limb.

(92) Characteristic features of the fractures of leg bone shafts:
- (1) Compound and infected
- (2) Tendency to redisplacements
- (3) Disturbance of alinement leads to:
  - (a) Serious disability
  - (b) Serious deformity
- (4) Slow union
- (5) *Recurrent œdema of the foot and clawing of the toes.*

(93) Treatment in nutshell of fractures leg bone shafts:
- (A) Open fractures: (a) debridement and suture skin
  - ↓ (b) reduction and fixation
- (B) Infected fract: (a) drainage
  - + (b) vaseline pack
  - + (c) skeletal traction
- (C) Closed fracture: (a) perfect reduction
  - + (b) plaster immobilization
  - or, skeletal traction.

(94) Unpadded cast is common in below-knee fractures
- (1) Ankle fractures:
  - (A) Torn ligaments with or without fracture malleoli
    - : Short below-knee walking plaster
    - Immediate walking
    - Removal of plaster after 3 weeks
  - (B) Fractures with displacement
    - : (a) Reduction: under local anæsthesia
    - (b) Plaster: U stirrup
      - back slab
      - encircling bandage.

(2) Fracture tibia:

(A) Simple fracture without gross displacement
: Immediate plaster cast

(a) Lower third: upto mid-thigh
(b) Upper two-thirds: upto groin

(B) Comminuted fracture with gross displacement
: Transfixion pin incorporation plaster with Bohler's walking iron.

(95) In fractures of the tibial shaft:
(a) Knee must be flexed to 10°
(b) Plaster must be as high as groin.

(96) After-treatment of all leg bones shaft fractures:
(1) Regular exercises: toes
transverse arch
quadriceps
(2) Elastic leg support: after removal of plaster.

(97) Transfixion of lower end of tibia is better than that of os calcis, as the latter is apt to cause:
(a) Subastragaloid movement limitations
(b) Talipes calcaneus
(c) Osteomyelitis os calcis with purulent arthritis.

(98) Injuries due to a fall from a height in the upright position:
(1) Fracture spine
(2) Fracture-dislocation ankle
(3) Fracture os calcis

(99) Every patient with a fractured spine must be examined for fracture os calcis and vice versa.

(100) Axial or plantaro-dorsal X-Ray plate is essential in suspected fracture of os calcis.

(101) There is no fracture in the body which is harder to treat than a crush fracture of os calcis.

(102) Fracture os calcis should be carefully looked for in every case of a fall from a height.

(103) Always forewarn the patient of after-effects in fracture of os calcis: (a) Flat foot
(b) Osteoarthritis ankle

(104) Osteochondritis juvenilis:

	Name	*Site*	*Age*
(1)	*Perthe:*	Neck and head of femur:	5–10
(2)	Osgood-Schlatter:	Tibial tubercle:	10–16

	Name	Site	Age
(3)	Sever:	Os calcis:	10–16
(4)	Kohler:	Tarsal navicular:	3–8
(5)	Freiburg:	Second metatarsal head;	
(6)	Scheuermann-calve:	Vertebræ:	10–21
(7)	Madelung:	Lower radius:	15–25

(105) Post-traumatic osteoporosis:
- (1) Kummel or Verneuil: post-traumatic spondylitis
- (2) Kienbock: post-traumatic carpal dystrophy : carpal semilunar
- (3) Sudeck's post-traumatic painful osteoporosis.

(106) Clinical stages and their treatment of acute osteomyelitis:
- (1) Stage of tension: Starr's decompression
- (2) Stage of decompression: closed antiseptic immobilization of Winnett Orr
- (3) Stage of sequelæ: sequestrotomy.

(107) Persistent pain at the end of a long bone, associated with metaphysial tenderness and general toxæmia is due to acute osteomyelitis.

(108) A joint adjacent to the site of acute osteomyelitis must always be examined prior to the operation.

(109) Involvement of multiple bones and joints, acute, subacute or chronic, some times arises after operation for a primary acute osteomyelitis focus.

(110) Treatment of acute osteomyelitis is. rest + sufficient drainage + packing.

(111) Treatment of acute osteomyelitis in children under two: Treat the child, not the lesion:
- (1) Conservative: fluids + rest + heat
- (2) Incision and drainage: definite abscess.

(112) Two views of treatment of acute osteomyelitis:
- (1) Early local decompression: of Starr
- (2) Late local drainage of soft tissue abscess when it presents: of Tyrrel Grey.

(113) Any bone operation done with temperature over 102°, is accompanied by heavy mortality.

(114) Splinting with weekly dressings give better results than Winnett Orr.

(115) A case of osteomyelitis may be said to be passing into a chronic stage if the sinus persists at the end of three months.

(116) Syphilitic periostitis is seldom limited to one bone.

(117) Diagnosis of osteomyelitis from sarcoma is particularly difficult in femur and humerus. *Biopsy is the only certain method.*

(118) Remember Ewing's sarcoma in every case of osteomyelitis.

(119) Three bone cond[illegible]

(1)
(2)
(3) Enchondromata.

(120) Rickets is a strain on homeostatic mechanism, where integrity of one function (blood calcium to prevent tetany) is preserved at the expense of another function (calcification), less important in the body mechanism.

(121) Metabolic diseases disturbing the calcium content of the bones:

(1) Rickets: abnormal deposition
(2) Osteomalacia
(3) Osteitis deformans } absorption after normal deposition
(4) Osteitis fibrosa

(122) Normal calcium content of the blood distinguishes osteitis deformans from osteitis fibrosa.

(123) Blood phosphatase is high in:

(1) Osteitis deformans
(2) Hyperparathyroidism
(3) Bone tumours

(124) A cancellous osteoma grows at the metaphysis of a long bone; a compact osteoma grows on membranous bones.

(125) Radium has no effect, on the other hand, it tends to increase the growth of myelomata

(126) Growths of Plasma cells:

(A) With Bence-Jones albumosuria
Myelomatosis of Kahler's disease

(B) Without Bence-Jones albumosuria

(*a*) Single plasmocytoma
(*b*) Multiple plasmocytomata

(127) (1) Recurrence, (2) Rapid growth, (3) Infiltration are common after operations on following benign growths:

(1) Mixed parotid tumour
(2) Costochondral chondroma
(3) Urinary papilloma

(128) Blood secondaries are more common in sarcomata: because of

(*a*) Thin walls
(*b*) Close proximity of cells
(*c*) Vascularity

(129) Bone sarcoma : some points :

(1) More than half are preceded by definite trauma

(2) Most constant symptom is pain

(3) Most common age is 10 to 20

(4) Most common sign : (a) local tumour
(b) local fracture

(5) Most common metastases are in lungs
: Bronchitis in old age

(130) Any case of constant or increasing localized pain in a bone, of unexplained origin, should be regarded as sarcoma and treated without delay.

(131) Early removal of the affected limb is by far the most effective method of treatment of bone sarcoma, followed by deep X-Rays local and to the chest, repeated at intervals of 6–12 months for three years.

(132) Local excision is enough treatment in cases of parosteal fibrosarcomata.

(133) Secondary carcinomata usually occur in the proximal parts of the limbs.

(134) Fluffiness and indefinite outline of compact tissue and medulla is characteristic in X-Ray pictures of early bone sarcomata.

(135) Innocent giant-celled tumour only destroys bone. In osteogenic sarcoma, some new bone is formed and growth is of varying consistency.

(136) Always take an X-Ray picture of the lungs before the surgical treatment of bone sarcoma.

(137) Treatment of bone sarcomata :

(1) Osteogenic : amputation

(2) Ewing : irradiation
↓ amputation

(3) Periosteal : excision
↓ amputation

(138) Ewing's sarcoma is radiosensitive ;

Osteosarcoma
Periosteal fibrosarcoma
Giant-celled tumour
} are non-sensitive to radiation

(139) (1) Local pain ; (2) Localized tenderness ; (3) Tumour ; (4) Pathological fracture ; (5) History of trauma are the main clinical picture of bone malignancy, primary or secondary.

(140) X-Ray picture of different bone tumours :
- (1) Giant-celled : (a) Epiphysis-eccentric
  - (b) Multicystic expansion
  - (c) Trabeculations *
  - (d) No ossification
  - (e) Rock bottom edge
- (2) Osteogenic : (a) Fluffy appearance
  - (b) Spindle swelling
  - (c) Cortical erosion
  - (d) Radiating ossification
  - (e) Codman's reactionary triangle
- (3) Ewing : (a) Patchy irregular coarse destruction
  - (b) Periosteal 'onion-peel' reaction
- (4) Metastatic carcinoma : cortical destruction
  - (new formation in prostati

(141) Ages in bone tumours :
- (1) Sarcomata : 10–30
- (2) Giant-celled : 20–30 (after union of epiphysis)
- (3) Metastatic carcinoma : after 40

(142) Carcinoma breast gives rise to bony metastases more quently than any other primary.

(143) Pathological fracture due to :
- (a) Sarcoma : does not unite
- (b) Secondary carcinoma : unites

(144) Any isolated bone lesion in old age : ? metastatic carcin from : (1) Breast
- (2) Thyroid
- (3) Hypernephroma
- (4) Prostate
- (5) Bronchus

(145) Introduction of pins in fractures of long bones :
- (1) Fracture neck of the femur
- (2) Fracture upper third of femoral shaft
- (3) Fracture upper part of the ulna.

(146) At least six months to a year must elapse between the heal of a septic process and bone-grafting

(147) Treatment of ununited fractures :
- (1) Beck's drilling
- (2) Matti's bone piece pack
- (3) Autogenous massive graft.

(148) Combined transfixion pin and Plaster-of-Paris :
- (1) Fracture tibia
- (2) Fracture os calcis
- (3) Fracture forearm bones.

(149) Main principles of fracture treatment:

(1) Reduce: (a) As soon as possible
(b) As perfectly as possible
(c) Under X-Ray control

(2) Fixation: without interruption until firm union

(3) Function: of the injured limb during the period of immobilization

(4) Unpadded cast

(5) Duration of plaster fixation depends on:
(a) Age of the patient
(b) Degree of injury
(c) Function of the part

(6) Under 12 years: it is very difficult to get poor results
After 40 years: it is very difficult to get good results.

(150) Local anæsthesia is very good for reduction of:

(1) All below-knee fractures
(2) All wrist and forearm fractures
(3) Fracture femur:
(a) Intracapsular neck
(b) Shaft.

(151) It is better to use no splint at all in fractures of infancy.

(152) Essentials of bone-graft operations

(1) Accurate fitting
(2) Complete immobilization
(3) Prolonged immobilization

(153) Plasters necessary for bone-graft operations

Ununited fracture	*Plaster*
Lower shaft tibia	Toes to groin (knee flexed)
Upper shaft tibia	Toes to hip spica
Lower shaft femur	Toes to hip spica
Upper shaft femur	Toes to double hip spica
Shaft radius & ulna	Hand to upper arm
Shaft humerus	Shoulder spica

(154) The main mass of the bone-graft is nothing more than an internal splint and a bone conducting scaffold, which is ultimately absorbed and replaced by new bone.

(155) The abduction splint is the main stand-by in the treatment of nearly all shoulder injuries.

CHAPTER VIII

THE JOINTS

(I) CONGENITAL ABNORMALITIES:

(1) CONGENITAL DISLOCATION OF THE HIP: (See under deformities)

(2) SPRENGEL'S SHOULDER: (See under deformities)

(II) TRAUMA:

(1) SPRAIN:

Def: Overstretching of ligaments with or without rupture

Etio: Presdisposer. Osteogenesis *imperfecta congenita*
Exciting: Direct or indirect strain

Path: (1) Rupture of ligament fibres
(2) *Synovitis with serous effusion*

Clinic. (1) Local pain on stretching the sprained ligament
(2 Local tenderness
(3) Synovial effusion

Diff. diag. (1) Dislocation
(2) Fracture (Carpal scaphoid)

Compl: (1) Dislocation
(2) **Fracture**
(3) Adhesions
(4) Infection
(5) Recurrence
(6) Osteoarthritis
(7) **T. B. Arthritis**

Treat: (A) (1) **Rest** in elevation with cold applications
↓ (2) **Elastic bandage** with counter irritants, heat and massage
↓ (3) Active movements
↓ (4) Active movements against resistence
↓ (5) Weight bearing:
Ind: Complete disappearance of pain, tenderness and effusion
↓ (6) **Thickening of the sole** borders and heel of the boots

(B) **Leriche's:** (1) Periarthrial *local novocain* injection
↓ (2) Immediate function

(C) **Strapping** or unpadded dorsal plaster cast

(II) DISLOCATIONS :

Def : **Dislocation :** Complete displacement of normal bony relations

Sub-luxation : Partial displacement, so as not to lose contact

Etio : (1) **Congenital :**

Cause : Incomplete development of bony constituents

Site : Hip joint

(2) **Pathological :**

Causes : (*a*) **Destruction :** Bones
: Travelling acetabulum
: Triple knee displacement

(*b*) **Distension :** Ligaments
: Charcot's joint

(*c*) **Disturbance of muscular balance :** Spasm
: Paralysis

(3) **Traumatic :**

Etio : Age : Middle
Sex : Male
Occup : Laborious
Anatomy : (*a*) Mobility of the joint
(*b*) Type of the joint

Path : (1) Ligaments : torn
(2) Bones : displaced, fractured
(3) Synovium : contused or torn
(4) Serous or hæmorrhagic effusion
(5) Trauma to extra-articular structures

Clinic : (1) History
(2) Pain : (*a*) Local
(*b*) Referred
(3) Loss of function : locking
(4) Deformity
(5) Anemalous relations of bony points
(6) Abnormal mensuration :
(*a*) Local bony landmarks
(*b*) Limb
(7) X-Rays

Compl : (1) **Fracture** dislocation
(2) **Unreduced** dislocation

(3) **Complicated** dislocation:
: (*a*) Vessels: gangrene or Volkmann
(*b*) Nerves: neuralgia or paralysis
(*c*) Muscles & tendons: rupture

(4) **Compound** dislocation

(5) **Recurrent** dislocation: shoulder, mandible

(6) **Ankylosis:**
(*a*) Adhesions
(*b*) Extra-articular:
: Callus
Fibrosis
Myositis ossificans

(7) **Arthritis:** (*a*) Traumatic
(*b*) Suppurative
(*c*) Osteoarthritis

(8) **Sudeck's** post traumatic acute bone atrophy

Treat: (*a*) **Reduction:** Under anæsthesia
By: (A) Manipulations
(B) Traction:
(*a*) Manual
(*b*) Weight

(*b*) **Fixation:** In reduced position
By: (*a*) Bandages
(*b*) Splints
(*c*) Plasters

(*c*) **After-treat:**
(*a*) Massage: next day
(*b*) Normal joint movements:
: Immediate
(*c*) Local joint movements:
: After ten days

(4) **Open reduction:**
Ind: (A) Failure of conservatism
Time: within a fortnight
(B) Compound dislocation

(III) FRACTURE DISLOCATION:

(A) Primary fracture with secondary dislocation
(B) Primary dislocation with secondary fracture
(C) Primary fracture and dislocation
(See under Joint Complications in Fractures)

(IV) INTERNAL DERANGEMENTS: (See under knee joint)

(V) PENETRATING WOUNDS OF THE JOINTS:

(A) **Recent cases: with infection not likely:**

Path: (*a*) Cases seen within twelve hours
(*b*) No penetration of joint cavity
(*c*) Penetration by aseptic instrument
(*d*) No contact with septic material

Treat: (1) Sterilization of the wound
(2) Rest: in the position of optimum function
(3) Aspiration: if much distension
(4) Aspiration + injection of 5 to 10 c.cs. of 1–1000 acriflavine
(5) Aspiration + canula lavage:
: If turbid effusion

(B) **Border cases: with infection probable:**

Path: (*a*) Cases seen after twelve hours
(*b*) Penetration by septic instrument
(*c*) Turbid effusion on aspiration

Treat: (1) Excision of wound: debridement
(2) Irrigation of the joint
(3) Partial or complete closure
: Drain upto but not into the joint
(4) Rest: in the position of optimum function

(C) **Frank septic or late cases:**

Path: (*a*) Intra-articular comminuted fracture
(*b*) Extensive intra-articular laceration
(*c*) Pyarthrosis

Treat: (1) Excision of the wound
(2) Removal of fragments
(3) Flavine wash
(4) Adequate drainage
(5) Post-irrigations
(6) Immobilization: in position of optimum function

(III) INFLAMMATION:

(A) TRAUMATIC ARTHRITIS:

(1) TRAUMATIC SYNOVITIS:

Etio: (1) Sprain
(2) Internal derangement

Clinic: (1) Joint effusion
(2) Position of greatest capacity
(3) Painful and limited movements
(4) Local tenderness

Clinical varieties:
(1) Acute
(2) Subacute
(3) Chronic
(4) Recurrent

Compl: (1) Sepsis
(2) **Adhesions** with ankylosis
(3) **T. B. Arthritis**
(4) Osteoarthritis

Treat: (A) **Acute:**
(1) **Rest with immobilization**
: In position of optimum function
(2) Cold lotions
(3) Firm bandage (compression)
(4) Aseptic aspiration if necessary

(B) **Subacute:**
(1) Rubefascients and counterirritants
(2) **Strapping and crepe bandage**
(3) Massage and movements

(C) Chronic
(1) **Strapping** with counterirritants
+ Protected function of the limb
(2) **Plaster-of-Paris** immobilization
↓ Protected function of the limb

(2) TRAUMATIC ARTHRITIS:

Causes: (1) Sprain
(2) Traumatic synovitis
(3) Internal derangements
(4) Intra-articular fractures
(5) Dislocation

Clinic. Same as synovitis. but more pronounced

Compl: Same as in synovitis
(1) Fibrous or bony ankylosis
(2) Suppurative arthritis

Treat. (1) Treat the Etiology
(2) As in synovitis

(B) INFECTIVE ARTHRITIS:

Varieties. (1) **Pyogenic**
(2) **Specific**
(3) **Zymotic**

Etio: (A) **Non-suppurative:**
(1) Sympathetic
(2) Tuberculous
(3) Syphilitic
(4) Gonorrheal
(5) Dysenteric
(6) Zymotic

(B) **Suppurative:**

- (1) Pyococcal: (*a*) Direct
  - (*b*) Regional extension
  - (*c*) Pyæmic
- (2) Gonorrheal
- (3) Pneumococcal
- (4) Tuberculous

Morb anat: (1) Synovium: suppurating granulations
veil of Billroth
pannus

(2) Cartilages: erosion, necrosis, absorption, separation

(3) Bone ends: rarefying osteitis
hypertrophic osteophytes

(4) Ligaments: softened, relaxed

(5) Bursæ: infected

(6) Muscles: spastic, atrophied

(7) Contents: effusion
fibrous adhesions
loose bodies

Clinical classification:

(A) (1) Non-suppurative
(2) Suppurative

(B) (1) Acute
(2) Subacute
(3) Chronic
(4) Recurrent

(C) (1) Effusive: hydrarthrosis
(2) Hypertrophic: (*a*) Synovial; (*b*) Osseous
(3) Atrophic
(4) Plastic: ankylosing

Clinical features:

(A) General. toxæmia

(B) Local:

(1) **Inflammatory swelling:**

(*a*) Shoulder: under the deltoid
: along the biceps
: axilla

(*b*) Elbow: either side of triceps

(*c*) Wrist: under extensors
: under flexors

(*d*) Hip: Scarpa's triangle

(e) Knee: sub-crural pouch
: patellar hollows

(f) Ankle: dorsum
: Either side of tendoachillis

(2) **Abnormal position:**

Factors: (a) Greatest capacity
(b) Muscle contractures
(c) Pathological dislocation

(a) **Shoulder: Adduction**

(b) **Elbow:**

(α) **Flexion 90° + Pronation**
or (β) **Flexion 110° + Mid position**

(c) **Wrist: slight flexion**

(d) **Hip:**

(α) **Flexion + abduction + eversion**
↓ (β) **Flexion + adduction + inversion**

(e) **Knee: Flexion 45°**

(f) **Ankle: Extension + Inversion**

(3) **Spasm of the muscles with wasting**

(4) **Limitation of movements** (all the movements)

Factors: (a) Pain
(b) Muscle spasm

(5) **Pain:**

Factors:
(a) Tension
(b) Muscle spasm
(c) Erosion of cartilages · starting pain

Compl: (1) General · (a) Toxæmia
(b) Septicæmia
(c) Pyæmia
(d) Amyloid disease

(2) Local. (a) Ankylosis
(b) Pathological dislocation
(c) Disorganization
(d) Sinuses

Treat (A) **Focal:** Treat any primary septic focus

(B) **General:**
(a) Antiseptics: sulphonamides
(b) Specifics: antisera
(c) Tonics

(C) **Local:**

(1) **Conservative: weight extension**

By: Adhesive plaster method

In: **Optimum function position**

(*a*) **Shoulder:**

(1) **Abduction 30°–50°**

+ (2) **Anterior to coronal plane**

(*b*) **Elbow: (The position depends on occupation)**

(1) **Straight and pronated**
: **Laborious occupation**

or (2) **Flexion of 135° + pronation**
: **Left hand**

or (3) **Flexion 90° + mid position**
: **Aesthetic**

or (4) **Flexion 90° + midway between midposition and pronation**
: **Writers**

or (5) **Flexion 45° + midway between midposition and supination**
: **Eating**

(*c*) **Wrist:**
Dorsiflexion 15° to 30°

(*d*) **Hip:**

(1) **Flexion 20°–30°**

+ (2) **Slight abduction: 20°**

+ (3) **Midposition**

(*e*) **Knee:**
5°–10° of flexion

(*f*) **Ankle:**

(1) **At right angle**

+ (2) **Slight inversion**

(2) **Aspiration:**

(A) **Simple aspiration:**

Ind: (1) Diagnostic:
: Rise in temp. with effusion in joint

(2) Therapeutic:
(*a*) Too much effusion
(*b*) Too long effusion
(*c*) Pyæmic joint
(*d*) Bad general condition

(B) **Aspiration with closed irrigation**
By: **flavine**, mercurochrome, eusol, saline
Ind: (1) Recurrence after aspiration
(2) Pyæmic joint

(3) **Operative:**

(A) **Arthrotomy—irrigation—closure:**
Ind. (1) Semipurulent effusion
(2) Recurrences after aspiration

(B) **Arthrotomy—Irrigation—Drainage:**
Ind (1) *Penetrating wounds with sepsis*
(2) Failure of repeated aspirations
(3) Extension from a neighbouring focus
(4) Sudden exacerbation
(5) *Severe toxæmia with* pyarthrosis

(C) **Arthrotomy—Carrel—Dakin—Drainage**
Ind: Bad pyarthrosis

(D) **Erasion:**
Ind Subacute or chronic arthritis with multiple septic foci on the bony end surfaces

(E) **Excision:**
Ind. (1) Failure of drainage
(2) Chronic stage. prolonged
(3) Sinuses
(4) Fibrous ankylosis painful
(5) Ankylosis in bad position
(6) Upper extremity
(7) Adult age
Tech: (*a*) **With mobility:**
: Upper extremity
(*b*) **With arthrodesis:**
Lower extremity

(F) **Disarticulation** by open method
Ind: Purulent arthritis of the knee, with life in danger
Tech: Long anterior convex flap *including patella*
After-treat Re-amputation higher up

(G) **Amputation:**
Ind: (1) Bad general condition
(2) Chronic amyloid toxæmia
(3) Useless disorganized joint

After-treat: (1) **Extension** (adhesive plaster) with splint
For: Three weeks after the wound has healed
↓ (2) **Simple splintage**
For: Two weeks more
↓ (3) **Active exercises**
(a) Unaffected joints. immediate
(b) Affected joints · at the end of (2)
+ (4) **Physiotherapy**

Special varieties of infective arthritis.

PYOGENIC ARTHRITIS.

Etio: (1) Direct infection · penetrating wound
(2) Local extension: osteomyelitis-metaphysitis
(3) Blood-borne: pyæmic, septicæmic
(4) Secondary infection: on tuberculosis, gonococcal arthritis

Path:
Clinic:
Compl:
Treat:
} As in acute arthritis (see above)

(A) PYOCOCCAL ARTHRITIS

Bact: Staphylococcal: thick pus
Streptococcal: thin pus

(B) PYÆMIC OR SEPTICÆMIC ARTHRITIS

Etio: Acute primary focus

Path: Rapid disorganization

Clinic: (1) **Rapid, painless, multiple pyarthrosis**
(2) *General high toxæmia*
(3) Primary septic focus: past or present

(C) PNEUMOCOCCAL ARTHRITIS

Etio: Both sexes
Children
One large joint

Path: (1) Primary · children
(2) Post-pneumonic: adults
(3) Septicæmic

Clinic: (1) **Primary:**
(a) Mild toxæmia
(b) Mild acute arthritis

(2) **Post-pneumonic.**
(a) History of pn
(b) Mild arthritis

(3) **Septicæmic:** (a)
(b)

Diagnosis: (1) Infancy: primary
or, Pneumonia: post-
or, Septicæmia: septi
+ (2) One large joint
(3) Aspiration: slightl
coa

Treat. (A) General: chemothe
(B) Local
(1) Aspiration:
(2) Arthrotomy —

After-treat. (1) Immobilization in
↓ (2) Physiotherapy and

(D) TYPHOID ARTHRI

Etio: Typhoid
Time: Acute or convalescent pe
Site: Hip joint
Clinic: (1) Mild serous arthritis
↓ (2) Severe suppurative.
Treat: Aspiration with closed la

(C) SPECIFIC ARTHRITIS:

(A) GONOCOCCAL ARTH

Etio: Frequency: 2–5%
Sex: Males
Site: Knee-ankle-
Time: Three weeks
charge

Path Gonococcal septicæmia al
articular structures end

Bact: (1) Sterile
(2) Pure gonococcal
(3) Mixed
(4) Pyococcal

Clinical varieties:
(1) **Wandering Pains:**
(2) **Arthralgia**
(3) **Hydrarthrosis:**
Persistent and recurrent non-inflammatory serous effusion in a large joint

(4) **Acute arthritis:**

Rapid inflammatory synovitis with periarticular œdema and swelling

(5) **Pyarthrosis:**

(a) Acute
(b) Subacute
(c) Chronic
Local and general signs less marked

(6) **Periarticular subacute or chronic oligo-arthritis:**

Sites: Small or large joints. hands, feet
Path Articular and periarticular fibrous adhesions

(7) **Plastic ankylosing arthritis:**

Adhesions and fibrous ankylosis
Quiet plastic arthritis
Atrophy of muscles

Diagnosis: (1) Mono-articular or oligo articular distribution in large joints
(2) Onset in several joints with settlement in one or two
(3) Urethral discharge: prostatic massage

Compl: (1) Fibrous ankylosis
(2) Rheumatoid arthritis
(3) Periarticular pseudo-ankylosis

Treat: (1) Stop mechanical treatment of gonorrheal urethritis
(2) General: vaccines; chemotherapy, protein shock
(3) Local:
(A) Arthralgia: counterirritants
(B) Hydrarthrosis:
Aspiration + counterirritants
(C) Subacute oligo-arthritis:
: Scott's dressing + rest
(D) Acute arthritis:
: Counter-irritants + rest
(E) Pyarthrosis: aspiration
↓ arthrotomy + lavage
↓ closure
(F) Plastic arthritis:
: Counter-irritants + strapping
+ movements
(4) Special: diathermy

(B) SYPHILITIC ARTHRITIS:

(I) **Congenital:**

(A) **Syphilitic osteochondritis:** Pseudo-paralysis

Etio: Infant under two years

Clinic: (*a*) Aversion to movements
(*b*) Joint effusion
(*c*) Other stigmata
(*d*) W. R. or Kahn

(B) **Cluttons joints:**

Etio: Age: 10–18: school going
Site: Knee

Clinic. (1) Family history
(2) Painless, subacute, symmetrical, serous synovitis
(3) Other stigmata:
(*a*) Interstitial keratitis
(*b*) Deafness
(*c*) Hutchinson's teeth
(4) W. R. or Kahn
(5) Therapeutic test

(II) **Secondary:**

(A) **Arthralgia**

(B) **Hydrarthrosis**

Site: Knee
Clinic: Symmetrical, bilateral; painless

(C) **Plastic arthritis and periarthritis:**

Site: Knee, elbow, midtarsal
Clinic. Monarticular ankylosing

(III) **Tertiary:**

(A) **Local synovial gumma:**

Site: Knee
Clinic: Localized swelling
↓ Gummatous abscess
↓ Gummatous ulcer opening into the joint

(B) **Gummatous synovitis:**

Clinic: Painless, irregular, diffuse, synovial thickening

(C) **Chondro-arthritis:**

Clinic: Painless osteoarthritis: with
(*a*) Synovial thickening
(*b*) No lipping

Treat: (1) Local: counter-irritation
(2) General: antisyphilitic

(IV) **Parasyphilis: Charcot's joints**

(C) TUBERCULOUS ARTHRITIS:

Etio: (1) Of bone tuberculosis
(2) Local: neglected sprains

Path:

Origin: (1) Synovial membrane
(2) Epiphysis, (3) Metaphysis } at the points of stress & strain

Spread: (1) Subchondral
(2) Perichondral synovial reflection

Morb. anat: (1) Synovium: pulpy pannus of T. B. granulations
(2) Art. cart: necrosis: (a) Subchondral
(b) Peripheral
(3) Bones: carious tuberculous rarefying osteitis
(4) Soft tissues: (a) White gelatinous swelling
(b) Cold abscesses
(c) Sinuses
(5) Interior. (a) Effusion: serous, pus, curdy
(b) Melon-seed loose bodies

Path. varieties: (1) **Synovial**: (A) **Acute**: Acute synovitis
(B) **Chronic**: Tumour Albus
: Œdema and infiltration of synovium and soft tissues
(C) **Fungating**:
: Exaggeration of (B)
(D) **T. B. Hydrops**:
: Effusion + melon-seeds
(2) **Osseous**: (A) **Ordinary**: (See under bones)
(B) **Carris Sicca**:
: Marked bone atrophy
: Obliterated joint cavity
: Periarticular atrophy
: Gradual ankylosis

Clinic:

(A) General: general signs and symptoms of tuberculosis
(a) Evening temperature with sweats
(b) Loss of weight

(B) Local: (1) **History**: Of slight and neglected trauma
(2) **Pain**: (a) Aching, relieved by rest
(b) On movements
(c) Starting pains

(3) **Function;** Weak → lost
Weak grip
Weak lift
Limping

(4) **Swelling:** Spindle shaped
(A) Pseudo: due to wasting of muscles
(B) Real: (*a*) Pulpy synovium
(*b*) Effusion
(*c*) Periarticular œdema

(5) **Deformity:**
Factors: (*a*) Effusion
(*b*) Muscular spasm
(*c*) Pathological dislocation
(*d*) Ankylosis

(6) **Muscular wasting:**
(*a*) Measurements
(*b*) Pseudo-prominence of bones
(*c*) Alteration of natural outlines

(7) **Palpation:**
(A) Rise in temperature
(B) Synovial and perisynovial thickening
(C) Local tenderness
(D) Rigidity
(E) Effusion and loose bodies

(8) **Movements:** Limitation of all active and passive movements
Factors: (*a*) Muscular spasm
(*b*) Ankylosis. Usually fibrous

(9) **Mensuration:**
(*a*) Shortening and lengthening
(*b*) Circumferential

(10) **Other signs:**
(A) Cold abscesses
(B) Sinuses
(C) Pathological dislocations
(D) Buristis

Sp. signs: (1) **X-Rays:** (*a*) Rarefaction
(*b*) Fluffiness
(*c*) Dislocations
(*d*) Ankylosis
(*e*) Alterations in joint space

(2) **Aspiration :** And examination of material :
- (i) Microscopic
- (ii) Culture
- (iii) Guinea-pig innoculation

(3) **Tuberculin test :**

Diff. diag : (1) **Joint conditions :**
: Any other acute, subacute or chronic arthritis

(2) **Bone conditions :**
: Osteomyelitis, periostitis, epiphysitis
New growths

(3) **Soft tissue conditions :**
: Bursitis, fibrositis, spasm of muscles

(4) **Functional**

Compl : (1) **Abscesses :** Cold
- (a) Sudden appearance
- (b) Tendency to wander
- (c) Lack of acute signs

(2) **Sinuses**

(3) **Extension to neighbouring tissues :**
Tendons, bursæ

(4) **Pathological dislocations :**
Wandering acetabulum
Triple knee displacement

(5) **Ankylosis :**
- (a) Fibrous
- (b) Bony : (α) Spine
  - (β) Secondary infection

(6) **Acute generalized tuberculosis :**
- (a) T. B meningitis
- (b) Acute miliary tuberculosis

Etio : Manipulations under anæsthesia

(7) **Toxæmia :**
- (a) Tuberculous
- (b) Septic : secondary infection
- (c) Amyloid

Prognosis : Factors : (1) Age : extremes bad
- (2) Family history and heredity
- (3) Surroundings
- (4) Stage of the disease
- (5) Presence or abscence of other foci
- (6) Presence of other complications
- (7) General health
- (8) Reaction to treatment

Treatment:

(1) **General**: Sanatorium: Rest + Diet + Tor
(Vit. D + Ca) + Heliotl

(2) **Specific**: Tuberculin, A. O.

(3) **Local**:

(A) **Conservative**:

(1) **Correction of Deformity: by**:
(a) Weight traction in the line of
mity to optimum position
(b) Repeated plasters

↓ (2) **Fixation of the joint**:
In: Position of optimum function
By. Plaster-of-Paris
For: One year after cessation of all cl
and radiological signs

↓ (3) **Support and protected movement**
Celluloid or leather jackets
Splints
Walking callipers

(B) **Operative**:

Ind: (1) Early stage. (extra-articular
arthrodesis)
(2) Failure of conservative treatme
(a) Abscesses and sinuses
(b) Disorganization and disloc
(c) Second focus
(d) Bad general condition
(3) Shortening the time of conserv
treatment
(4) Improvement of faulty position
(osteotomy; arthrodesis)
(5) *Regaining mobility*:
(elbow, temporo-mandibular ;
(6) Getting rid of the focus.
(amputation)

Operations (1) **Extra-articular arthrodesis**: l
(2) **Aspiration**: With injection of
or iodoform
Ind: Cold abscesses
Pyarthrosis
(3) **Arthrotomy—Lavage—Closu**
Ind: Doubtful diagnosis
Rapid pyarthrosis
(4) **Arthrectomy**: Excision of affe
tissues only
Ind: Children with growing epipl

(5) **Erasion:** Excision of affected tissues
+ Removal of a slice of articular cartilage
Ind: Children with growing epiphyses

(6) **Excision:** Excision of all intra-articular soft tissues
+ Excision of articular ends of bones
+ Excision of focus in epiphysis

(A) **With fixation:**
Ind: *As a rule*

(B) **With mobility at the joint:**
Ind: Adults
Superior extremity joints
Contraind: Children upto 16
Lower extremity joints

(7) **Amputation:**
Ind (*a*) Septic sinuses
(*b*) Recurrence after or failure of conservatism
(*c*) Focus elsewhere
(*d*) Toxæmia with general bad health

(D) TOXIC OR METABOLIC ARTHRITIS:

Varieties: (1) Focal secondary arthritis
(2) Arthritis deformans
(A) Rheumatoid arthritis
(B) Osteoarthritis
(3) Acute rheumatic arthritis
(4) Gout

(1) FOCAL SECONDARY ARTHRITIS:

Etio: Septic focus: tooth, tonsil, etc.

Clinic: (1) Acute, (2) Subacute (3) Chronic
(1) Monarticular, (2) Oligarticular
(3) Polyarticular

Treat. (1) Treatment of primary focus:
. Tonsillectomy, removal of teeth, etc.
(2) Specific:
: Anti sera, vaccines
(3) Conservative treatment of arthritis

(2) ARTHRITIS DEFORMANS:

Varieties: (1) **Acute polyarticular**
(2) **Chronic polyarticular**
(3) **Chronic monarticular**

(A) RHEUMATOID ARTHRITIS:

Def: Slowly progressive, bilateral, symmetrical crippling polyarticular disease, with acute, subacute or insidious onset, involving first the metacarpo-phalangeal and proximal interphalangeal joints, leading to thickening of the soft parts with fibrosis and contractures and atrophy of cartilage, bone, muscles and tendons, in women under 40.

Etio: Sex: female
Age: 20–40
Predisposers: (1) Congenital
(2) **Endocrine disturbance**
(3) **Metabolic**
(4) Neurotrophic
(5) **Toxic:** (α) Non-specific
(β) Infective
(γ) Intestinal
(6) Infective: microbic
(α) Specific
(β) Mixed

Path: (A) **Atrophy of articular elements:**
: Bones and cartilages
(B) **Infiltration, fibrosis and contracture of synovium and periarticular elements**

Morb. anat: (1) Synovial membrane and periarticular soft tissues:
(*a*) Infiltration
↓ (*b*) Fibrosis
↓ (*c*) Thickening, contractures, adhesions
(2) Bones and cartilages.
. Atrophy
(3) Ligaments, muscles and skin:
: Atrophy
(4) Synovial fluid:
: Reduced
(5) General toxic, vasomotor and neurotic changes

Clinical varieties:
(1) Acute
(2) Subacute
(3) Chronic
(4) Still's disease

(1) **Prodromal stage**
(*a*) Sensory
(*b*) Motor
(*c*) Vasomotor

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(1) **Prodromal stage**
(a) Sensory
(b) Motor
(c) Vasomotor

(2) **Active stage:**

(A) General: (*a*) Pyrexia
(*b*) Tachycardia
(*c*) Vasomotor symptoms

(B) Local: Symmetrically bilateral polyarticular fusiform swellings of the small joints of the hand *with onset:*
(*a*) Acute with pyrexia
or (*b*) Subacute with pyrexia
or (*c*) Insidious without pyrexia

(C) Regional: (1) Muscular spasm and atrophy
(2) Vasomotor signs
(3) Garrod's nodules
(4) Spender's patches

(3) **Sequelæ stage:**

(*a*) Articular atrophy
(*b*) Periarticular contractures: limited movements
(*c*) Deformities: (1) Flexion type
(2) Extension type
(3) Mixed type
(4) Ulnar deviation type
(*d*) Regional atrophic changes: muscles, skin

Diff. diag: (1) Acute rheumatism
(2) Gonorrheal rheumatism
(3) Osteoarthritis
(4) Chronic gout

Sequelæ: Crippling and deformities

Treat: (1) General: (*a*) Metabolic
(*b*) Detoxic
(*c*) Tonic
(*d*) *Parathyroidectomy*

(2) Local: (*a*) Complete rest with extension
↓ (*b*) Massage, hyperæmia, electrotherapy
↓ (c) Passive and active movements

STILL'S DISEASE:

Etio: Age: before second dentition

Clinic: (1) Joints: stiffness and fusiform swelling of multiple symmetrical joints with: (*a*) Synovial thickening
(*b*) Periarticular thickening
(*c*) Effusion
(*d*) Muscular wasting

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(*b*) Periarticular thickening
(*c*) Effusion
(*d*) Muscular wasting

(2) Lymph glands: hard, discrete, painless enlargement
(3) Spleen: enlarged
(4) Lymphocytosis

(B) OSTEOARTHRITIS: (1) **Monarticular**
(2) **Oligarticular**

Def: Localized monarticular or oligarticular condition
With: (A) **Central atrophy:**
. With grooving and eburnition
+ (B) **Peripheral hypertrophy:**
. With osteophytes

Due to Disturbances of nutrition of articular cartilages

Brought about by: Trauma, toxæmia, neurotrophic factors or metabolic products

Etio: Elderly males
Predisposers (1) Septic **toxæmia**
(2) **Arteriosclerosis**
(3) Slight and repeated **trauma**
(4) Neural or **metabolic** factor
Sites: Knee, hip, metacarpophalangeal joint of thumb or great toe

Path. **Disturbance of nutrition of articular cartilage:**
By: (1) Septic absorption low grade toxæmia
or, (2) Chronic repeated trauma
or, (3) Arteriosclerosis
or, (4) Nervous factor
or, (5) Metabolic factor
or, (6) Internal secretion disturbances

Morb. anat: **Central degeneration and peripheral hypertrophy of articular cartilage:**
(1) **Art. cart:**
(A) Epiarticular and periarticular:
· Hypertrophy } **osteochondrophytes**
· Ecchondroses }
(B) Central: atrophy with eburnation
(2) **Synovial mem.: hypertrophied villi:**
: Synovial chondromata
: Lipoma arborescence
(3) **Intra-articular menisic, ligaments, tendons:**
. Disappearance, atrophy
(4) **Capsular ligament:**
: Ossification
(5) **Loose bodies:**
(a) Separated articular cartilages
(b) Separated osteochondrophytes
(c) Separated hypertrophied villi

(6) **Baker's cysts**

(7) **Heberden's nodes :**

: Symmetrical bony outgrowths from the bones of interphalangeal joints

Clinic : (1) Pain + stiffness + **crepitus**

(a) Barometric joint

(b) Working loose

(2) Limited or **locked movements**

(3) Enlarged bony ends with **osteophytes** and villi

(4) X-Rays : (a) Osteophytes

(b) Distorted shape of bone ends

(c) Increased density

(d) Heberden's nodes

(5) Pressure symptoms :

Spondylitis deformans, morbus coxæ

Sites. (1) **Hip :** Morbus coxæ senilis

(2) **Knee joint :** (a) Dry type

(b) Wet type

(c) Intermediate type

(3) **Metacarpophalanx of thumb**

(4) **Metatarsophalanx of hallux**

(5) **Temporomandibular :**

Treat : (1) Conservative ·

(1) Treat any primary focus

(2) General : tonics, endocrine

(3) Local : (A) Acute : rest

(B) Chronic : physiotherapy

(2) Operative :

Ind : (1) Relief of pain

(2) Relief of instability

(3) Correction of faulty ankylosis

(4) Mobilization

Operations · (1) Aspiration with oxygen replacement

(2) Arthrotomy : with evacuation of fluid with ether lavage

: with cheilotomy

(3) Excision : with arthroplasty

· with arthrodesis

(4) Parathyroidectomy

(5) Sympathetic ganglionectomy

(3) ACUTE RHEUMATIC ARTHRITIS

Clinic : (1) High pyrexia with perspiration

(2) Wandering acute arthritis

(3) Response to salicylates

(4) Heart or tonsil lesion

(4) GOUTY ARTHRITIS:

Site: Thumb or great toe

Clinic: (1) Acute, subacute or chronic arthritis
(2) Chalky deposits

(5) NEUROTROPHIC ARTHRITIS:
Neuropathic arthropathy

(1) HYSTERICAL JOINTS:

Def. Hyperalgesia and muscular contracture without any organic joint lesion

Etio. (1) Young women and girls
(2) Neurotic temperament

Clinic: (1) Sudden, dramatic, unexplained, complete onset
(2) Inspection: (α) Unusual, unpathological posture
(β) No muscular wasting
(3) Palpation (α) Superficial intense hyperalgesia
(β) Glove and stocking anæsthesia
(γ) Distraction test
(4) Movements: fixed rigidity with relaxation under
(α) Distraction
(β) Anæsthesia
(5) No primary pathological lesion
(6) Mental symptoms: neurotic, sensitive

Diagnosis: (1) X-Ray
(2) General anæsthesia } No abnormality detected

Diff diag: (1) Joint conditions
(2) Muscle conditions
(3) Nerve conditions
(4) Spinal and central diseases

Treat: (1) General: tonics
(2) Psycho-therapy
(3) Local: no active treatment

(2) CHARCOT'S JOINT:

Def. Degenerative arthritis secondary to nervous disturbances *causing loss of trophic influence*

Etio: Causes: (1) **Tabes dorsalis**: 80%
(2) **Syringomyelia**
(3) Other nervous lesions
Frequency: (1) In tabes dorsalis 3%
(2) In syringomyelia. 30%

Path: (1) Nervous disturbance
↓ (2) **Loss of trophic influence**
↓ (a) Loss of pain → repeated trauma
+ (b) Loss of vasomotor control → vasodilatation → absorption
+ (c) Loss of joint mechanism
↓ (3) **Degeneration + new bone formation**

Morb. anat: (1) Articular ends: decalcification and absorption
(2) Peripheral: chondro-osteophytes
(3) Soft tissues: disintegration
disorganization

Path. varieties: (1) **Atrophic**:
(*a*) Absorption of bony ends
(*b*) Lax capsule
(*c*) Abnormal range of movements
(2) **Hypertrophic**:
(*a*) Lumpy irregular osteophytes
(*b*) Calcareous capsule
(*c*) Locking of the movements
(3) **Osteoarthritic**: Midway between (1) and (2)
(4) **Hydrarthrotic**:
(*a*) Effusion excessive
(*b*) Atrophied bone ends
(*c*) Lax capsule
(*d*) Abnormal movements

Sites: (1) **Knee: Tabes Dorsalis**
(2) Hip
(3) Foot and ankle
(4) **Shoulder: Syringomyelia**
(5) Wrist
(6) Elbow
(7) Vertebræ

Clinic: (1) **Onset**: Sudden, dramatic, painless
(2) **Local**:
(A) Atrophic: painless abnormal mobility
(B) Hypertrophic: locking with irregular bony ends
(C) Osteoarthritic: crepitus + locking
(D) Hydrarthrotic: excessive effusion
(3) **X-Rays**: Atrophy, hypertrophy,
Osteophytes, calcifications
(4) **Associated diseases**:
(A) **Tabes Dorsalis**: (knee)
Argyll-Robertson pupil
Loss of knee jerks
Ataxia
Anæsthesia sole
Romberg's signs
Dysuria
Visceral crises

(4) GOUTY ARTHRITIS:

Site: Thumb or great toe

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Etio. (1) Young women and girls
(2) Neurotic temperament

Clinic. (1) Sudden, dramatic, unexplained, complete onset
(2) Inspection: (α) Unusual, unpathological posture
(β) No muscular wasting
(3) Palpation (α) Superficial intense hyperalgesia
(β) Glove and stocking anaesthesia
(γ) Distraction test
(4) Movements. fixed rigidity with relaxation under
(α) Distraction
(β) Anaesthesia
(5) No primary pathological lesion
(6) Mental symptoms. neurotic, sensitive

Diagnosis. (1) X-Ray
(2) General anaesthesia } No abnormality detected

Diff diag. (1) Joint conditions
(2) Muscle conditions
(3) Nerve conditions
(4) Spinal and central diseases

Treat: (1) General tonics
(2) Psycho-therapy
(3) Local no active treatment

(2) CHARCOT'S JOINT:

Def: Degenerative arthritis secondary to nervous disturbances causing loss of trophic influence

Etio. Causes: (1) **Tabes dorsalis:** 80%
(2) **Syringomyelia**
(3) Other nervous lesions
Frequency: (1) In tabes dorsalis: 3%
(2) In syringomyelia: 30%

Path: (1) Nervous disturbance
↓ (2) **Loss of trophic influence**
↓ (a) Loss of pain → repeated trauma
+ (b) Loss of vasomotor control → vasodilatation → absorption
+ (c) Loss of joint mechanism
↓ (3) **Degeneration + new bone formation**

Morb. anat: (1) Articular ends: decalcification and absorption
(2) Peripheral: chondro-osteophytes
(3) Soft tissues: disintegration
disorganization

Path. varieties: (1) **Atrophic:**
(a) Absorption of bony ends
(b) Lax capsule
(c) Abnormal range of movements
(2) **Hypertrophic:**
(a) Lumpy irregular osteophytes
(b) Calcareous capsule
(c) Locking of the movements
(3) **Osteoarthritic:** Midway between (1) and (2)
(4) **Hydrarthrotic:**
(a) Effusion excessive
(b) Atrophied bone ends
(c) Lax capsule
(d) Abnormal movements

Sites: (1) **Knee: Tabes Dorsalis**
(2) Hip
(3) Foot and ankle
(4) **Shoulder: Syringomyelia**
(5) Wrist
(6) Elbow
(7) Vertebræ

Clinic: (1) **Onset:** Sudden, dramatic, painless
(2) **Local:**
(A) Atrophic: painless abnormal mobility
(B) Hypertrophic: locking with irregular bony ends
(C) Osteoarthritic: crepitus + locking
(D) Hydrarthrotic: excessive effusion
(3) **X-Rays:** Atrophy, hypertrophy, Osteophytes, calcifications
(4) **Associated diseases:**
(A) **Tabes Dorsalis:** (knee)
Argyll-Robertson pupil
Loss of knee jerks
Ataxia
Anæsthesia sole
Romberg's signs
Dysuria
Visceral crises

(4) GOUTY ARTHRITIS:

Site: Thumb or great toe

Clinic: (1) Acute, subacute or chronic arthritis
(2) Chalky deposits

(5) NEUROTROPHIC ARTHRITIS:
Neuropathic arthropathy

(1) HYSTERICAL JOINTS:

Def. Hyperalgesia and muscular contracture without any organic joint lesion

Etio: (1) Young women and girls
(2) Neurotic temperament

Clinic: (1) Sudden, dramatic, unexplained, complete onset
(2) Inspection: (α) Unusual, unpathological posture
(β) No muscular wasting
(3) Palpation: (α) Superficial intense hyperalgesia
(β) Glove and stocking anæsthesia
(γ) Distraction test
(4) Movements: fixed rigidity with relaxation under
(α) Distraction
(β) Anæsthesia
(5) No primary pathological lesion
(6) Mental symptoms: neurotic, sensitive

Diagnosis: (1) X-Ray
(2) General anæsthesia } No abnormality detected

Diff. diag: (1) Joint conditions
(2) Muscle conditions
(3) Nerve conditions
(4) Spinal and central diseases

Treat: (1) General: tonics
(2) Psycho-therapy
(3) Local: no active treatment

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(*d*) Abnormal movements

Sites: (1) **Knee: Tabes Dorsalis**
(2) Hip
(3) Foot and ankle
(4) **Shoulder: Syringomyelia**
(5) Wrist
(6) Elbow
(7) Vertebræ

Clinic: (1) **Onset:** Sudden, dramatic, painless
(2) **Local:**
(A) Atrophic: painless abnormal mobility
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(C) Osteoarthritic crepitus + locking
(D) Hydrarthrotic: excessive effusion
(3) **X-Rays:** Atrophy, hypertrophy, Osteophytes, calcifications
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(A) **Tabes Dorsalis:** (knee)
Argyll-Robertson pupil
Loss of knee jerks
Ataxia
Anæsthesia sole
Romberg's signs
Dysuria
Visceral crise

(B) **Syringomyelia:** (shoulder)
  (1) Thenar and hypothenar atrophy
  (2) **Dissociation of sensations**
    (a) No pain and thermal sense
    (b) Normal tactile and muscle sense
  (3) Trophic changes: hand
  (4) Scoliosis
  (5) Spastic legs
  (6) Unequal pupils

Complications (1) Hydrarthrosis
  (2) Hæmarthrosis
  (3) Fractures: with non-union
  (4) Dislocations
  (5) Infections
  (6) Crippling

Treat: Orthopædic apparatus

(IV) ABNORMAL CONTENTS IN THE JOINTS:

(1) HYDRARTHROSIS

Def. Copious and persistent serous effusion in a joint

Causes: (A) **Traumatic arthritis**
  (B) **Specific arthritis:** Syphilis, gonorrhea
  (C) Osteoarthritis
  (D) Neurotrophic arthritis
  (E) Intermittent hydrarthrosis:
    Etio: Sex: both
      Age. 10–40
    Path: Angio-neurotic œdema
    Clinic: Sudden intermittent effusion

(2) HÆMARTHROSIS:

Etio: (a) Traumatic
  (b) Blood conditions. hæmophilia, scurvy

Clinic. (a) Sudden rapid effusion
  (b) Signs of arthritis
  (c) Blood examination: (α) Coagulation time
    (β) Blood platelets

Compl: (a) Recurrence
  (b) Adhesions and ankylosis
  (c) Osteoarthritis

Treat: (a) Rest and cooling lotion
  (b) Intravenous: blood transfusion
    : calcium gluconate or chloride

(c) Intramuscular: hæmoplastin
coagulen ciba
blood serum

(d) No surgical interference in blood conditions

(3) PYARTHROSIS:

Causes: Suppurative arthritis:
(1) Trauma with infection
(2) Pyococcal: local or pyæmic
(3) Specific with secondary infection

(4) LOOSE BODIES IN THE JOINT:

Sources: (1) Synovial fluid hæmorrhagic clots
T. B. melon-seeds
(2) Synovial membrane: villous fringes
synovial chondromata
(3) Cartilage: loose pieces of articular or semilunar cartilage chondrophytes
(4) Bones: osteophytes

Nature. (1) Fibrinous: tuberculous joints
(2) Fibrofatty: (a) Osteoarthritis
(b) Rheumatoid arthritis
(c) Neurotrophic arthritis
(3) Bony and cartilaginous:
(a) Osteoarthritis
(b) Neurotrophic arthritis
(α) Marginal
(β) *Osteochondrophytes*
(γ) Synovial chondromata

Found in: (1) **Traumatic joints**
(2) **Tuberculous joints**
(3) **Osteoarthritis**
(4) **Neurotrophic arthritis**
(5) Rheumatoid arthritis

Sites. (1) **Knee**; (2) Shoulder; (3) Elbow

Clinic: (1) **Recurrent temporary locking** + pain + effusion
(2) Palpable loose body
(3) Underlying synovitis or arthritis
(4) X-Rays

Compl: Osteoarthritis

Treat: Excision after exploration
(a) Fixation by a needle
or (b) Washed out by saline syringe

(V) ANKYLOSIS:

Def: Diminution in the normal range of movements of a joint

(A) **False ankylosis :**

Def : Ankylosis due to extra articular causes

Causes : **Extra-articular :**

(1) Skin : scars
(2) Muscles : contractures ; spasms
(3) Fascia : contractures
(4) Tendons : contractures
(5) Nerves . paralytic contractures
irritation spasm
(6) Bones : callus, new growths
(7) Vessels : aneurysm

(B) **True ankylosis :**

Def . Ankylosis due to articular causes

(1) **Fibrous :** (*a*) **Adhesions :**

Fibrous bands uniting two mobile bony ends

(*b*) **Ankylosis :**

Fibrous union of bony ends

Causes : (1) **Traumatic synovitis**
(2) Hæmarthrosis
(3) Low grade infection
(4) **Tuberculosis**
(5) **Gonorrhea**
(6) Rheumatoid
(7) Sympathetic synovitis
(8) Prolonged immobilization

Clinic : (A) Adhesions : pain and limited movement, which stretches the adhesion

(B) Ankylosis : (*a*) **Slight painful mobility**
(*b*) X-Rays

(2) **Bony :**

Causes : (*a*) **Pyococcal arthritis**
(*b*) T. B. gonorrheal with secondary infection
(*c*) Osteoarthritis or Charcot
(*d*) Hypercalcæmic ankylosing polyarthritis

Clinic : (1) **Absolute absence of mobility**
(2) **No pain on attempts at movements**
(3) X-Rays
(4) Hypercalcæmia [in (*d*) above]

(A) **Pathological ankylosis :**

: Result of disease

(B) **Therapeutic ankylosis :**

: Result of arthrodesis

(A) **Sound ankylosis :** No active disease
Stationary position

(B) **Unsound ankylosis :** Active disease
Progressive deformity

Positions of ankylosis :

Joint	*Pathological*	*Therapeutic*
Shoulder	Adduction Inversion	Abduction : 45° - 90° Flexion : 20° External rotation 15°
Elbow	(*a*) Flexion 90° Pronation or (*b*) Flexion 110° Midposition	(*a*) Straight + Pronation : Labourers (*b*) Flexion 135° + Pronation : Left hand (*c*) Flexion 90° + Midposition : Aesthetic (*d*) Flexion 90° + Midway between midposition and pronation : Writers (*e*) Flexion 45° + Midway between midposition and supination : Feeding
Wrist	Slight flexion	Dorsiflexion 45°
Hip	(*a*) Flexion Abduction Eversion ↓ (*b*) Flexion Adduction Inversion	Flexion 20°-30° Abduction 20° Neutral rotation
Knee	Flexion 45°	(*a*) Flexion : 5° - 10° (*b*) Straight : : After excision and arthrodesis
Ankle	Extension Inversion	Right angle Slight inversion

Treatment: (1) **Preventive:**
- (A) Fixation in position of optimum function
- (B) Early physiotherapy and active movements

(2) **Curative:**
- (A) Conservative:
  - (1) **Gradual weight extension**
  - (2) **Manipulations:**
    - (a) Intermittent gradual
    - ×(b) Forcible under anæsthesia

    Compl: (α) Traumatic synovitis
    (β) Fracture
    (γ) Reformation of adhesions
    (δ) Exacerbation of infection
- (B) Operative:

  Ind. (a) To increase or regain mobility
  (b) To improve position
  (c) To relieve pain

  Oper. (1) **Excision:** With
  - (a) **Arthroplasty**

    Ind. (α) Non-tuberculous
    (β) Upper extremity
    (γ) Mobile joints
  - (b) **Arthrodesis:**

    Ind (α) Tuberculous
    (β) Lower extremity
    (γ) Weight bearing

  (2) **Extra-articular osteotomy:**

  With. (a) **Union** in sound position
  (b) **False joint:** Esmarch

  (3) **Extra-articular arthrodesis:**

  Ind. (1) Removal of pain and instability of hip
  (2) T.B ankylosis

(VI) OPERATIONS ON THE JOINTS:

Pre-operative:
- (1) X-Ray
- (2) Plaster, splint or extension preparation
- (3) Prolonged and efficient aseptic preparation
- (4) No touch technique
- (5) Tourniquet: Use tourniquet in joint surgery

  Contraind: (a) Abscess
  (b) Arteriosclerosis
  (c) Age over 50
  (d) Very long operation

Removal: (a) Open method:
Remove the tourniquet before closure
↓ Deliberate ligature of bleeding points
(b) Closed method·
Removal after closure and firm bandage

Compl. (1) Hæmorrhage more · loose application
(2) Gangrene: (a) Too long and too tight
(b) Arteriosclerosis
(3) Injury to · (a) Skin
(b) Vessels: contusion, Volkmann
(c) Nerves. paralysis
(4) Delayed healing

(1) Manipulations under anaesthesia:
Ind: (1) Traumatic periarticular extrasynovial adhesions
(2) Intra-articular adhesions.
(a) Recent cases
(b) Sterile cases
(c) Mild adhesions

Contraind (1) Firm ankylosis: Fibrous or Bony
(2) Dovetailing or bony block
(3) Destruction of articular cartilage
(4) Latent or present or recent sepsis
(5) Old cases
(6) Shortening of extra articular important structures
: Vessels, nerves

Compl (1) Traumatic synovitis
(2) Reformation of adhesions
(3) Exacerbation of infection
(4) Fracture
(5) Rupture of extra-articular structures
. Vessels, nerves, tendons

Post treat. (1) Rest, elevation, bandage or cooling lotions for 48 hours
(2) Active movements.
. As soon after the acute phase as possible
(3) Physiotherapy

(2) Aspiration of joints:
Ind: (1) Diagnostic
or, (2) Therapeutic
In: (a) Synovitis with much or prolonged effusion
(b) Hydrarthrosis
(c) Hæmarthrosis
(d) Pyarthrosis

Tech: Very rigid asepsis

Sites: (a) Through thin portion of the capsule
(b) Avoid important structures

(1) Hip joint: Below the anterior superior spine
Between: (a) Sartorius
& (b) Tensor fasciæ femoris
Direction: in + back + up
(2) Knee joint Above and outer side of patella
Direction: downwards + slightly backwards

(3) Arthrotomy: Exposure of a joint
Ind. (1) Diagnostic (a) Some traumatic joints
(b) Biopsy
(2) Infection: (a) Diagnosis
(b) Drainage
(3) Trauma (a) Setting fracture-dislocations
(b) Repair or excision of torn intra articular tissues
(c) Removal of foreign or loose bodies
(4) Preliminary to other operations on joints

(4) Arthrectomy:
(a) Exposure
(b) Dissection and curettage of only diseased foci
Ind (a) Childhood
(b) Disease of soft tissues only (synovial)

(5) Erasion:
(a) Exposure
(b) Dissection and curettage of diseased foci.
(c) Removal of a slice of articular cartilage
Ind: (a) Focus in soft tissues and articular surfaces
(b) Children

(6) **Excision:**
Tech: (a) Exposure
(b) Excision of all intra-articular soft tissues
(c) Excision of articular ends of the bones
(d) Excision of the focus in the epiphyses
Ind: (1) Chronic persistent focus in the articular ends
(2) Adults

(7) **Arthroplasty:**
Def: Artificial pseudarthrosis for mobility
Tech: (a) Exposure

Ind: (A) Absolute:
(1) Bilateral ankylosis of the hip
(2) Bilateral ankylosis of the elbow
(3) Ankylosis temporomandibular joint

(B) Good:

(1) Traumatic (2) Stophylo or *strepto coccal* (3) Gonococcal (4) Pneumococcal	Ankylosis *with no evidence* of activity

(C) Medium:
(1) Fibrous ankylosis
(2) Rheumatoid arthritis
(3) Osteoarthritis

(D) Bad: tuberculosis
(E) Adults
(F) Upper limb and mandible

Contraind: (1) Active infection
(2) Tuberculosis
(3) Extensive adhesions of soft tissues
(4) Muscular weakness or incoordination
(5) Pathological bony ends
(6) Children: under 16

Prognosis: Good, in: (1) Age: 20–40
(2) General health: good
(3) Mental aspect: intelligent *co-operating*
(4) Absence of local scar tissue

Sites: (1) Good results: (1) Elbow
(2) Hip
(3) Jaw

(2) Medium: knee

(8) **Arthrodesis:**

Def: Bony fixation of a joint in best functional position

Tech: (A) **Intra-articular:**

Tech: (*a*) Exposure
(*b*) Excision
(*c*) Apposition of raw bony surfaces
(*d*) Bone-graft across

After-treat: Fixation: in best functional position
: By Plaster-of-Paris
: For not less than three months

(B) **Extra-articular:**

Tech: (1) Exposure of bony points:
(*a*) Proximal to the joint
(*b*) Distal to the joint

(2) Preparation of the bony points
(3) Bone-graft between the points

After-treat: Prolonged fixation in optimum position

Ind: (1) Loss of muscle control: Infantile paralysis
(2) Painful joint
(3) Mal ankylosis
(4) Inveterate chronic disease: Tuberculosis; osteoarthritis
(5) Lower limb: weight supporting

(C) **Combined intra and extra articular arthrodesis**

DISEASES OF SPECIAL JOINTS:

(1) TEMPOROMANDIBULAR JOINT:

(I) TRAUMA:

(A) Dislocation:

Etio: (1) Blow on the chin
(2) Dental extraction
(3) Yawning

Varieties: (1) Unilateral
(2) Bilateral: (*a*) Forwards
(*b*) Backwards
(*c*) Upwards

Path: (1) *Traumatic*
(2) Pathological: suppurative or osteoarthritic disorganization

Clinic. (1) **Inability to close the mouth**
(2) *Displacement*
(*a*) Unilateral. lateral to the opposite side
(*b*) Bilateral: downwards
(3) Palpation.
(*a*) Hollow in front of tragus
(*b*) Condyle in anterior position

Compl: (1) Adhesions: fibrous ankylosis
(2) Unreduced dislocation
(3) *Recurrent dislocation*:
(A) Snapping joint: (See internal derangement)
(B) Recurrent dislocation:
Etio: Disorganization of joint
Laxity of capsule
Clinic: Habitual dislocation
Easy reduction & recurrence
Treat: Hey Grove's operation
(Neck of the jaw tied to mastoid by forearm tendon)
(4) Osteoarthritis

Treat: (1) Reduction: pressure on the third molars by thumb down and back
+ Simultaneous lift of the chin by last two fingers
(2) Fixation: by: fourtailed bandage
for: three weeks
(3) After-treat: liquid diet for a few days

(B) Fracture-dislocation:

Etio: Blows on the chin
Path: (1) Dislocation
(2) Fracture: (*a*) Neck of the mandible
(*b*) Floor of the cranium:
: (Central dislocation)
Treat: (1) Manipulations
(2) Operative reduction
(3) Excision of the head
(4) Conservative → excision of the head

(C) Internal derangement: snapping jaw

Etio: Abnormal intra-articular meniscus
Path: Slipping of the head with a snap
Clinic: Snapping jaw
Treat: Excision of the meniscus

(II) INFLAMMATIONS:

Special Etio: (1) Traumatic
(2) Infective:
(A) Pyogenic: (*a*) Pyococcal:
: Bursting of a parotid or middle ear abscess into the joint
(*b*) Pyæmic
(B) Specific: gonorrheal
(C) Osteoarthritis: trismus + crepitus
(*a*) Post-traumatic: unreduced dislocation
fracture dislocation
recurrent dislocation
snapping jaw
(*b*) Toxic or metabolic

(III) ANKYLOSIS OF JAW: TRISMUS

Varieties:

(A) Intra-articular fibrous or osseous

Etio: (1) Infective suppurative arthritis
: Gonorrhea
Pyococcal
Pneumonic
Tuberculosis
Typhoid

(2) Traumatic arthritis
(3) Hyper calcæmic polyarticular ankylosis

(B) **Extra-articular fibrosis or ossification or infiltration:**

Etio: Burns, lupus, cancrum oris, myositis ossificans, carcinoma

(C) **Bony block:** Pseudo ankylosis

Etio: Osteoarthritis
Unreduced dislocation
Callus formation
Malunited fracture
Tumours

(D) **Reflex spasmodic conditions:**

Etio: (a) Muscles: tetanus, hysteria
(b) Inflammatory: parotitis, tonsillitis, lymphadenitis

Clinic: Painful or painless trismus

Treat: (1) Treatment of primary focus in reflex
(2) Removal of the block where possible
(3) **Excision of the head:**

Ind: Fibrous ankylosis
Unreduced dislocation
Malunited fracture

(4) **Esmarch's operation:** Extra-articular pseudarthrosis

Ind. Advanced bony or fibrous ankylosis
Destruction and fibrosis of surrounding muscles

(IV) OPERATIONS ON TEMPORO-MANDIBULAR JOINT

(1) **Excision: for intra-articular ankylosis**

Ind. Trismus: (a) Dislocation condyle
(b) Dislocation fibro-cartilage
(c) Arthritic ankylosis

Tech. (1) Incision (a) Transverse along lower border of zygoma or: on level with tragus
or, (b) Vertical. parallel to ramus
or, (c) Curved incision as in mastoid operations severing the pinna

(2) Preserve: facial nerve branches
(3) Exposure of the joint
(4) Incision of the capsule
(5) Excision of the condyle or removal of fibro cartilage
(6) Closure

After-treat: Early movements
Compl: (1) Transient facial palsy
(2) Parotid fistula

(2) Esmarch's operation: for extra-articular ankylosis

Ind: (a) Extra-articular ankylosis
(b) Advanced intra-articular bony or fibrous ankylosis
Tech: (1) Removal of (a) Wedge (with apex at the alveolar margin) from the angle of the jaw
(b) Ascending ramus
(2) Interposition of muscles between bony surfaces
After-treat: Early movements and exercises

(2) STERNOCLAVICULAR JOINT:

(1) Dislocation:

Etio: (a) Falls on shoulder
(b) Direct injury
Varieties: (1) Forwards
(2) Upwards
(3) Backwards
Clinic: Local examination
Compl. (1) Pressure: on vessels, nerves, trachea, œsophagus (in upward and backward dislocation)
(2) Unreduced dislocation
(3) Recurrent dislocation
Treat: (1) **Conservative:**
(A) Reduction: backward pull on shoulders with knee against upper dorsal spine
↓ (B) Fixation:
In: Shoulder: braced back
Arm: adducted
Elbow: flexed
By: Sling and a bandage
Over: (1) An axillary pad
(2) Local pressure pad
(2) **Operative:**
Ind: (a) Unreduced dislocation
(b) Recurrent dislocation
Tech: (1) Wiring
(2) Fascial graft
(3) Excision

(2) Traumatic arthritis
(3) Hyper calcæmic polyarticular ankylosis

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Etio : Burns, lupus, cancrum oris, myositis ossificans, carcinoma

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Etio : Osteoarthritis
Unreduced dislocation
Callus formation
Malunited fracture
Tumours

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Clinic : Painful or painless trismus

Treat : (1) Treatment of primary focus in reflex
(2) Removal of the block where possible
(3) **Excision of the head :**

Ind : Fibrous ankylosis
Unreduced dislocation
Malunited fracture

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(2) **Operative:**
Ind: (a) Unreduced dislocation
(b) Recurrent dislocation
Tech: (1) Wiring
(2) Fascial graft
(3) Excision

(2) **Arthritis :** (*a*) Traumatic
(*b*) Pyæmic
(*c*) Tuberculous
(*d*) Gonococcal

(3) ACROMIOCLAVICULAR JOINT

Dislocation :

Etio : Football and industrial accidents

Path : (*a*) Subluxation : coracoclavicular ligament intact
(*b*) Dislocation : coracoclavicular ligament torn

Varieties : (*a*) Superior
(*b*) Posteroinferior
(*c*) Anteroinferior
(*d*) Backward

Clinic . (*a*) Displacement of clavicular end
(*b*) Synovitis
(*c*) X-Rays

Compl : (1) Unreduced dislocation
(2) Recurrent dislocation

Treat : (1) Conservative :
(A) Reduction : by manipulation
↓ (B) Fixation :
In : Arm : adduction over an axillary pad
Elbow : flexed
Hand . to opposite shoulder
By : Elastoplast
Around : The clavicle and elbow
For : 3 weeks : in subluxation
5 weeks : in dislocation
(2) Operative :
(A) Wiring
(B) Suture : fascial graft, palmaris longus
(*a*) Clavicle to acromion
(*b*) Clavicle to coracoid

(4) SHOULDER JOINT :

(A) CONGENITAL :

Sprengel's shoulder : (See under deformities)

(B) TRAUMA

(1) **Sprain :** (*a*) Rupture of muscle : supraspinatous
(*b*) Rupture of tendon : biceps
(*c*) Rupture of capsular ligament

(2) **Dislocation :**

Etio : Middleaged males (after 20)
Excitor : Indirect trauma :
With : Outstretched arm with **abducted shoulder**

(A) **Trauma in shoulder abduction**

Path : (1) Tear in the inferior portion of the capsule
↓ (2) **Subglenoid** : *Lower margin of the glenoid*
: In front of long head triceps
: Below subscapularis
: Above teres minor

↓ (3) **Forward ;**

(A) **Subcoracoid ;**
: In front of scapular neck
: Below the coracoid
: Medial to glenoid edge

(B) **Subclavicular :**
: Below the outer end of clavicle
: Under the pectoralis

(4) **Backwards :**

(A) **Subspinous ;**
: *Under the spine in infraspinatous fossa*

(B) **Subacromial :**
: Under the acromion in supraspinatous fossa

(5) **Downwards : Luxatio erecta**

(B) **Impact along the long axis of superior limb in adducted and extended position**

(1) ***Supraglenoid** dislocation*
With : fracture acromion

Clinic : (1) **Deformity :**

(A) Flat shoulder
(B) Axis of the arm :
(1) Upwards+inwards
(2) Backwards (if anterior)
(3) Forwards (if posterior)
(C) Elbow : Away from the trunk
Posterior : if anterior dislocation
Anterior : if posterior dislocation

(2) Painful and limited movements

(3) Palpation :
(A) Absence of head in normal position
(B) Presence of head in abnormal position

(4) Mensuration: acromial tip to external condyle
(A) Shortening of the arm
(B) Lengthening of the arm: (subglenoid)

Special signs: (1) **Hamilton:** Acromion and ext. condyle in one straight plane
(2) **Dugas:** Inability to place the hand on opposite shoulder on adduction of the elbow
(3) **Callaway:** Increase in vertical measurement round the axilla
(4) **Bryant:** Lowering of axillary folds

Compl: (1) **Fracture-dislocation:**
Sites: Neck: anatomical or surgical
Tuberosities
Glenoid rim
Coracoid process
Acromion
Clinic: (*a*) Failure of the head to rotate with shaft
(*b*) Crepitus
(*c*) Easy reduction and recurrence
(*d*) X-Rays

(2) **Complicated dislocation:**
(A) Pressure on vessels: œdema, cyanosis, gangrene
(B) Pressure on nerves: neuralgia, paralysis
(C) Rupture of muscles and tendons:
: Supraspinatous, biceps
: Easy reducibility and easy recurrence

(3) **Unreduced dislocation:**
Causes: (*a*) Adhesions
(*b*) Interposition: capsule, biceps
(*c*) Fractures

(4) **Recurrent dislocation:**
Etio: (*a*) Frequent trauma: epilepsy
(*b*) Lacerated rotators
(*c*) Separation of tuberosities
(*d*) Capsule: torn or loose
Clinic: Habitual recurrence on abduction of the arm with easy or even auto reduction

(5) **Ankylosis:** Adhesions:
Etio: (1) Periarthritis
(2) Fracture or dislocation

(3) Therapeutic immobilization

Clinic : Deficient abduction and eversion

Treat : (1) Active exercises :

(a) Eversion

↓ (b) Abduction

(2) Manipulations under anæsthesia

Ind : Failure of exercises

Contraind : Early inflammatory stage

(6) Osteoarthritis : (a) Unreduced dislocation

(b) Recurrent dislocation

Treat :

(1) **Conservative :**

(A) **Reduction :** Under general anæsthesia

(1) **Kocher :**

(a) Traction in the long axis of humerus

(b) Flexion + adduction of elbow

(c) Slow and gentle external rotation of the arm

(d) Upward and forward position of elbow (front of the chest)

(e) Swift internal rotation of arm (hand to opposite shoulder)

(2) **Heel in axilla :** Traction down and out

(3) **Hyperextension :** Traction

(B) **Fixation :**

In : (a) Adduction over axillary pad

or (b) Partial abduction and eversion

If : (α) Fracture great tuberosity

(β) Avulsion supraspinatous

By : Bandage and sling

For : Four days

After-treat : (1) Distal joint exercises : immediate

(2) Massage : following day

(3) Shoulder active move : 3 weeks

(4) Shoulder abduction } 4 weeks

(5) Sling discarding } 4 weeks

(2) **Operative :**

Ind : (1) **Failure of conservative measures :**

: Open reduction

(2) **Fracture-dislocation :**
  (A) Robert Jone's manipulations
    : 150° abduction + traction + digital manipulations
  (B) Open reduction

(3) **Old unreduced dislocation :**
  (A) Manipulations : upto 2 months
  (B) Open reduction : after 2 months

(4) **Recurrent dislocation :**
  (A) **Operations on capsule :**
    (*a*) Excision
    (*b*) Plication + coracoid buttress : Oudard
    (*c*) Reattachment to glenoid : Perthe
    (*d*) Repair of ant part . Bankart
  (B) **Operations on the humeral head :**
    (slinging)
    (*a*) Hey Grove : fascia lata
    (*b*) Nicola : long biceps tendon
    (*c*) Henderson : facial sling
  (C) **Extra-articular operation :**
    Clairmont : muscle sling

After-treat · Fixation .
  In : Arm : adducted
    Forearm : across the chest
  For : Two weeks

(C) ACUTE INFECTIVE ARTHRITIS :

Clinic : Position : adduction or slight abduction
  Swelling : (*a*) Under the deltoid
    (*b*) Along the biceps
    (*c*) Axilla
Treat : Position : (*a*) 45° to 90° abduction
  + (*b*) 20° anterior to coronal plane
  + (*c*) 15° external rotation

(D) TUBERCULOSIS OF THE SHOULDER :

Etio : Third decade
Path : Caries sicca in humeral head
Clinic : (1) Pain
  (2) Weak function
  (3) Swelling : not marked
  (4) Rigidity : limitation of all movements
  (5) Deformity : adduction + inversion
  (6) Muscular wasting : **pronounced**
  (7) Cold abscesses and sinuses

Diagnosis : **Wasted deltoid with painful restriction of abduction in middle age**

Diff. diag: (1) Other causes of arthritis
(2) Adhesions
(3) Subdeltoid bursitis; subacromial bursitis
(4) New growths

Prognosis: Fibrous ankylosis in adduction and inversion

Treat:
(1) **Conservative**: (A) Weight extension to correct the deformity
↓ (B) Fixation:
In: Optimum position
By: Plaster-of-Paris
(2) **Operative**: Excision

(E) OSTEOARTHRITIS OF THE SHOULDER:

Clinic: (a) Elderly patient
(b) Painful movement
(c) Crepitus

(F) CHARCOT'S SHOULDER JOINT:

Etio: Syringomyelia

Clinic: (1) Shoulder condition: atrophic, hypertrophic, hydrarthrotic
(2) Syringomyelia signs

(G) OPERATIONS ON THE SHOULDER JOINT:

(1) **Exposure**:

Incisions: (A) **Anterior**: (a) Along the anterior edge of the deltoid
From coracoid to tuberosity
(b) Separation of deltoid from pectoral
(B) **Posterior**: (a) Acromioclavicular joint
↓ Over the shoulder
↓ Posterior axillary fold
(b) Division of acromial base
(c) Reflection of acromion with deltoid forwards
Ind: Tuberculosis
(C) **Deltoid flap**:
(a) Transverse incision across the top of the shoulder
(b) Division and downward reflection of deltoid

(2) Arthrotomy:

Ind: (a) Infective purulent arthritis
(b) Loose bodies
(c) Lavage
(d) Irreducible fracture dislocations and epiphysial displacements

Tech: (1) Exposure
(2) Incision into the capsule
For drainage: (a) Anterior incision
(b) Counter incision:
· At the apex of the axilla with the arm drawn upwards above the head on a forceps passed across the joint cavity

(3) Excision:
Ind: (a) Tuberculosis
(b) Destructive infective arthritis
(c) Compound fracture dislocations
(d) Irreducible dislocation: with
(α) Fracture humerus
(β) Failed manipulations
(γ) Older than six weeks
(e) Tumours of the humeral head
Tech. (1) Exposure
(2) Dislocation of long tendon of biceps
(3) Open the capsule
(4) Detachment of both tuberosity muscle insertions
(5) Section of the bone
(a) Through anatomical neck
(b) Through the tuberosities
(6) Beveling the cut end
(7) Closure
After-treat· 1st day. Splint or plaster in optimum position
10th day: Renewal of plaster
22nd day. Removal of superior part of arm and forearm part of plaster
Massage + faradism
Three months. Removal of the whole plaster

(4) Arthroplasty:
Ind. (a) Malankylosis
(b) Ankylosis of shoulder+scapula
(c) Painful ankylosis
(d) Unreduced dislocation
Essentials: (a) Strong functioning deltoid
(b) Adequate lever
Tech: (a) Excision: gap between the bones: half inch
(b) Interposition of. fascia lata
or: subcutaneous tissues
(c) Closure
After-treat: 1st day Splint or plaster in optimum position
10th day: Renewal of plaster
22nd day: Removal of superior part of whole plaster
Active movements+physiotherapy

(5) Arthrodesis:
Ind: (1) T.B. Shouler
(2) Flail shoulder } with good scapular muscles
(3) Deltoid paralysis }

Tech:
- (A) Intra-articular:
  - (1) Excision: by anterior route
    - (*a*) Head present:
      - : Removal of opposing cartilaginous Surfaces and synovial membrane
    - (*b*) Head absent:
      - : Freshening the under surfaces of:
      - : Acromion, glenoid, humeral extremity
  - (2) Bone-graft: (A) Greater tuberosity
    - ↓ Humeral head
    - ↓ Glenoid
    - ↓ Scapular spine
  - (3) Position of ankylosis:
    - (A) Children: 90° abduction
      - + 30° eversion
      - + Elbow in front of body line
    - (B) Adults: 70° abduction
- (B) Extra-articular:

Ind: T. B. in adults

Tech: Insertion of acromion into greater tuberosity

Position of ankylosis: 80° abduction
- + 30° eversion
- + 30° flexion

After-treat: Fixation:
- In: Shoulder. in optimum position
  - Elbow : at right angles
  - Wrist : dorsiflexed
- By: Plaster of Paris
- extent: Over both the shoulders to hip round the trunk
- For: Three months

Removal of forearm and arm part only of the superior aspect of the plaster + physiotherapy - after 3 weeks

(6) Recurrent dislocation of the shoulder
- (A) Bankart. (*a*) Anterior incision
  - (*b*) Coracoid division
  - (*c*) Subscapularis tenotomy
  - (*d*) *Repair of the glenoid ligament*
- (B) Oudard: (*a*) Separation of anterior deltoid
  - (*b*) Coracoid division
  - (*c*) Subscapularis tenotomy
  - (*d*) Plication of the capsule
  - (*e*) Subscapularis shortening
  - (*f*) Turning down coracoid with muscles
  - (*g*) Closure

After treat: Fixation:
- In: Arm : adduction
  - Elbow: flexion 90°
- By: Plaster of Paris
- For: Ten weeks

(C) Clairment:

Tech: (1) Anterior deltopectoral incision
(2) Dissection of quadrilateral space
(3) *Posterior incision: along posterior deltoid edge*
(4) Dissection of posterior strip of deltoid
(5) Suture of the strip end to: anterior deltoid
or: subscapularis
through: quadrilateral space

After treat. Arm bandaged to the side with sling to forearm
Movements of elbow: 2nd day
Movements of shoulder: 22nd day

(5) ELBOW JOINT:

(1) DISLOCATION:

Etio. (1) Falls on hand with
(*a*) Extended elbow
(*b*) Flexed pronated forearm } backward
(2) Falls on flexed elbow: forward
(3) Twists: lateral or ulna only

(A) Both bones:

Etio: Age: Children and adolescents
Frequency: Next to shoulder

Varieties: (1) **Posterior:**
Associated: (*a*) Fracture coronoid (after 14)
(*b*) Brachialis laceration

(2) **Anterior:**
Associated: (*a*) Fracture olecranon
(*b*) *Triceps laceration*
Compl: Ulnar paralysis

(3) **Lateral:** Incomplete

(3) Recurrent dislocation:
: Fracture olecranon or coronoid

(4) Complicated dislocation:
(a) Vessels: gangrene
Volkmann
(b) Nerves: median, radial, ulnar
(c) Muscles: myositis ossificans: brachialis

(5) Arthritis: (a) Traumatic
(b) Infective
(c) Osteoarthritis

(6) Extra-articular ankylosis

Treat:

(1) **Conservative:**

(A) **Reduction:**
(1) Posterior: flexion of the elbow across the knee → traction on the forearm
(2) Anterior: traction → extension → local pressure from the front

(B) **Fixation:**
in: (a) Posterior:
. Elbow at right or acute angle
(b) Anterior:
: Elbow extended
by: (a) Posterior:
(α) Posterior gutter splint
(β) Posterior plaster slab
(γ) Collar-cuff sling
(b) Anterior:
: Anterior plaster slab

(C) **After-treat:**
(a) Finger and shoulder exercises:
: Immediate
(b) Elbow exercises: three weeks
(c) Sling discontinuation: three weeks

(2) **Old unreduced dislocation:**
(A) Manipulations: upto six weeks
(B) Open reduction:
(C) Sham reduction.
: (α) Flexion above right angle
(β) Collar-cuff for three weeks
(γ) Active exercises
(D) Arthroplasty: with plaster for four weeks

(B) **Dislocation of the ulna only:**

Etio: Twist of the forearm
Path: Posterior

(C) **Dislocation of the radius only:**

Etio: (*a*) **Congenital**

(*b*) **Traumatic:**

Path: (α) Forward dislocation of the head
+ (β) Fracture upper third ulna

Clinic: (α) Movements: limited flexion and supination
+ normal pronation

(β) Position: slight flexion
+ midway position

(γ) Palpation: tenderness
+ displaced head
+ ulnar fracture

Treat: (A) **Conservative:**

(*a*) Reduction: traction with backward local pressure

(*b*) Fixation:
In: Flexion + supination
Over: anterior pad

(*c*) Physiotherapy: after 3 weeks

(B) **Operative:**

Ind: Recurrence
Tech: Excision of head

(C) **Subluxation of the Radius: (Pulled elbow)**

Etio: Young children
Pull on forearm

Path: Nipping of synovial membrane between orbicular ligament and radial head

Clinic. (*a*) Inability to supinate and extend
(*b*) Local pain and tenderness

Treat: Full flexion
↓ Full extension
↓ Full supination

(2) ARTHRITIS:

Path: Position: (*a*) Flexion 90° + Pronation
(*b*) Flexion 110° + Midposition

Swelling: Either side of triceps

Therapeutic position:
(1) Laborious: (*a*) extension + pronation
(2) Left hand: flexion 135° + pronation
(3) Aesthetic: flexion 90° + midposition
(4) Writing: flexion 90° + midway between midposition and pronation
(5) Feeding: flexion 45° + midway between midposition and supination

(3) SYPHILIS: **Secondary monarticular plastic arthritis and periarthritis:**
(See under general joints)

(4) TUBERCULOSIS:

Etio: Age: 30 Years
Senile struma

Path: Origin: (*a*) Osseous: young
(*b*) Synovial: senile

Varieties: (*a*) Pulpy: synovial
(*b*) Hydrops with melon-seeds

Clinic: (1) Pain
(2) Weak function
(3) Swelling: fusiform
(4) Deformity: flexion 120° + pronation
(5) Palpation: pulpy feel or fluctuation
(6) Limited movements
(7) Muscular wasting: pronounced
(8) Mensurations: muscular wasting
(9) Abscesses and sinuses
(10) X-Rays

Sequelæ: (1) Abscesses and sinuses
(2) Ankylosis: fibrous
(3) Bursitis

Treat:

(A) **Conservative:** Fixation:
In: Optimum position
By: Plaster-of-Paris
For: Three months after clinical cure

(B) **Operative:**

Ind: (*a*) Failure of conservatism
(*b*) Complications
(*c*) Adults

Tech: (1) Arthrectomy: before 17
(2) **Excision: after 17**
(3) Amputation

(5) LOOSE BODIES: **Melon-seeds**

(6) OPERATIONS ON ELBOW JOINT:

(A) **Arthrotomy:**

Ind: (*a*) Drainage
(*b*) Removal of loose bodies
(*c*) Lavage

Incisions: (*a*) External to olecranon
Counter incision: (*b*) Inner side through the joint
Save: Ulnar nerve

(B) **Exposure:**

(1) **Lateral:**

(a) Incision: 1'5" above the external condyle
↓ External condyle
↓ Radial head
↓ 2" below the elbow joint

(b) Division of extensor aponeuroses and capsule in the line of incision

(2) **Posterior:**

(a) Incision: vertical posterior midline with centre at the olecranon tip down to the bone

(C) Excision:

Ind: (a) Compound comminuted fracture
(b) Tuberculosis
(c) Suppurative disorganization
(d) Persistent sinuses
(e) Ankylosis: traumatic or infective

Tech: (1) Incision: posterior vertical
(2) Peeling off the bones. (a) Outer side tissues
(b) Inner side tissues
(3) Bone section: gap of 1'5–2 inches
(a) Humerus. transverse through the middle of the internal epicondyle
(b) Forearm bones. level of radial neck

After-treat: 1st day: fixation at right angles on metal splint
11th day: assisted active movements
22nd day sling with flexion + physiotherapy

Compl: (1) Ulnar nerve injury
(2) Flail joint:
Causes: (a) Non-preservation of triceps insertion
(b) Treatment in extension
Treat: (a) Reattachment of triceps to reformed olecranon
(b) Arthrodesis
(c) Elbow support apparatus

(D) Arthroplasty:

Ind: As in excision: with
(a) Skilful occupation
(b) Relatively healthy bones
(c) Small degree of painful movement

Tech: (a) Incision: posterior
(b) Flap of deep fascia and aponeurosis from posterior forearm muscles with pedicle attached to inner humeral condyle
or: Fascia lata flap

(c) Bone section:
(α) More from humerus
(β) Save radius and ulna as much as possible
(d) Suture of the flap (b) over the humeral head
(e) Rearrangement of triceps tendon:
(α) Z division + lengthening
or (β) Albee technic:
: Piece of ulna with triceps insertion turned up and reattached at a higher level

After-treat: Fixation:
In: Elbow: flexion
By: Plaster-of-Paris
Extent: Metacarpal heads to axilla
For: Three weeks
Active exercises and physiotherapy: after three weeks

Compl: (a) Flail elbow
(b) Ankylosis

(E) Excision of the radial head:

Ind: (a) Ankylosis of superior radio-ulnar joint
(b) Fracture head or neck of the radius
(c) Unreduced dislocation of radial head

Tech: (1) Incision. external condyle → radial head →
(2) Exposure of the joint
(3) Excision of the radial head
(4) Interposition of fascial graft
(5) Closure

After-treat: 1st day: (a) Fixation:
In. elbow at right angles
forearm supinated
By: interrupted elbow splint
(b) Active finger exercises
22nd day. Acive voluntary movements

(6) WRIST, CARPAL AND CARPOMETACARPAL JOINTS:

(A) TRAUMA:

(1) Sprain of the wrist:

Etio: Falls or twists

Clinic: (1) Pain + tenderness + effusion
(2) Negative X-Ray

Diff. diag: Fracture navicular

Treat: (1) Strapping
or (2) Dorsal plaster cast
In: Dorsiflexion
For: Ten days

Compl: (1) Traumatic tenosynovitis:
Site: Thumb extensor
Clinic; Pain + swelling + crepitus on movement

Treat: (a) Strapping
or (b) Dorsal plaster cast
In: Dorsiflexion
For: Three weeks
(2) Tendo-vaginitis stenosans:
Site: Thumb extensor
Clinic: (a) Pain: half inch above radial styloid
+ on adduction of the thumb
(b) Hard palpable nodule
Treat: Longitudinal division by: (a) tenotome
(b) open operation
(3) Peritendinous fibrosis:
Site: Extensors of the hand
Clinic: Circumscribed hard swellings
Treat: Dorsal plaster cast

(2) Dislocation of wrist joint:

(A) Inferior radio-ulnar joint

(B) Radio-carpal:

Path. (a) Backwards
(b) Forwards
Clinic: (a) Deformity
(b) Normal styloid relationship
Diff. diag. (1) Colles' fracture
(2) Separation of radial epiphysis
(3) Sprain with synovitis
(4) Fracture navicular
(5) Dislocation of a carpal bone

(C) Mid-carpal Joint

(D) Semilunar:

Varieties: (a) Retro-lunar dislocation of os magnum
(b) Forward dislocation
(c) Total dislocation
Clinic: (a) Deformity: (α) Anterior projection
(β) Posterior projection
(b) Painful immobility of semiflexed fingers
(c) Median nerve paralysis
Compl: (a) Fracture scaphoid
(b) Avascular necrosis
(c) Traumatic arthritis
Treat:
(1) Manipulative reduction: With traction
Hyper extension } + local pressure
↓ Hyper flexion }
(2) Operative reduction:
Ind: Unreduced dislocation for 2 weeks
Sequelæ: (a) Avascular necrosis
(b) Degenerative arthritis

(3) **Excision:**
Ind: (a) Total dislocation
(b) Failure of reduction
(c) Recurrence of dislocation
(d) Old unreduced dislocation
Tech: Incision 2 inches along the medial side of flexor carpi radialis

After-treat: (1) Fixation:
In Wrist:
(a) Flexion 45°: for one week
↓ (b) Neutral position: for two weeks
By: Dorsal plaster cast
Extent: Below elbow to metacarpal heads
For: Three weeks (renewed after first week)
(2) Immediate finger exercises

(E) **Os Magnum:**
Path: Backwards
Clinic: Swelling under the extensor tendons
Treat: (1) Reduction: local pressure on flexed wrist
(2) Excision

(F) **Carpo-metacarpal joints:**
Site: 2nd to 5th
Path: Dorsal displacement of metacarpal bases
Diff. diag: Bennett's fracture: (if thumb)
Treat: (1) Traction with pressure
or (2) Open reduction. if manipulations fail
After-treat: (1) Fixation:
In: Wrist dorsiflexed 45°
By: Plaster-of-Paris
Extent: Metacarpal heads to below elbow
For: Three weeks
(2) Finger exercises

(B) ARTHRITIS OF THE WRIST:
Path. position: Slight flexion
Swelling: (a) Under extensors
(b) Under flexors
Therapeutic position: Dorsiflexion 45°

(C) TUBERCULOSIS OF THE WRIST AND CARPAL JOINTS:
Etio: Age: (a) Young adults
(b) Senile struma
Path: Origin: (a) Synovial
(b) Osseous:
: Radius; 2nd or 3rd metacarpal
(c) Tendon sheaths

(3) Extra-articular arthrodesis of wrist: Logroscino
: Dorsal radial bone-graft across the joint from radius to metacarpal bones

(7) METACARPO-PHALANGEAL AND INTER-PHALANGEAL JOINTS:

(A) TRAUMA:

(1) **Thumb:** (or other metacarpo-phalangeal joints)

(A) **Sprain of the thumb:**

Treat: Firm strapping for 3 weeks

(B) **Subluxation of the thumb:**

Path: Rupture of the metacarpo-phalangeal lig.
Clinic: Lateral instability of the thumb
Treat: Operative reduction
↓ Plaster fixation for 4 weeks

(C) **Dislocation of metacarpo-phalangeal joint of the thumb:**

Path. (*a*) Displacement: phalanx back and out
(*b*) Interposition: **glenoid ligament**
Flex. long. poll.
Sesamoid bones

Treat: (1) **Reduction:** By manipulations
: Traction
↓ Hyperextension } of the joint
↓ Sudden flexion } of the joint
↓ Out pressure on metacarpus
(2) **Posterior tenotomy of glenoid ligament**
(3) **Open reduction:**
(*a*) Posterior incision
(*b*) Lateral incision

After-treat: Fixation:
In: Moderate flexion
By: Plaster-of-Paris
For: 3 weeks

(2) **Inter-phalangeal joints:**

(A) **Sprain:**

Treat: Fixation
In: Slight flexion
By: Collodion gauze
For: 3 weeks

(B) Dislocation:

Treat: (*a*) Manipulative reduction:
: *Hyperextension*
↓ Traction
↓ Flexion

(*b*) Fixation:
In: Flexion
By: Plaster
For: 3 weeks

(C) Fracture-dislocation:

Path: (*a*) Chip fracture
(*b*) Condyle fracture
(*c*) Base fracture

Compl: Recurrence of dislocation

Treat: (1) As in Bennet's fracture-dislocation
(2) Continuous traction

(B) ARTHRITIS:

(1) **Gonococcal arthritis:**
(*a*) Affection of multiple joints with settlement in one or two
(*b*) History of urethral discharge

(2) **Rheumatoid arthritis:**
(*a*) Vasomotor signs
(*b*) Joint signs: acute, subacute, chronic
: multiple joints
(*c*) General signs
(*d*) Sequelæ signs: atrophy, contractures, deformities

(3) **Osteoarthritis:** Metacarpo-phalangeal joint of the thumb

(4) **Gout:** Metacarpo-phalangeal joint of the thumb

(C) *OPERATIONS ON THE JOINTS:*

(1) **Open reduction of dislocations**

(2) **Arthroplasty of thumb joints:**

Ind: (*a*) Impossible reduction
(*b*) Damaged cartilage

Tech: Incisions: (A) Trapezio-metacarpal:
: Between ext. poll. long. and ext. poll. brev.
(*B*) *Metacarpo-phalangeal:*
: Along the radial side of ext. poll. long.

After-treat: (1) Extension: for two weeks
↓ (2) Movements

(8) SACRO-ILIAC JOINT:

(A) TRAUMA:

Sacro-iliac relaxation, subluxation or strain:

Etio: (*a*) Traumatic
(*b*) Chronic strain
(*c*) Unduly mobile joints

Path: (*a*) Forward inclination of the sacrum relative to ilium:
(Upper end of sacrum: forwards)
or (*b*) Perpendicular sacrum:
(Upper end of sacrum: backwards)

Clinic: Pain + tenderness: (*a*) Local
(*b*) Sciatic

Treat: (1) **Conservative**
(*a*) Manipulations under anæsthesia
↓ (*b*) Rest in bed: for two weeks
↓ (*c*) Strapping of pelvis
(2) **Pelvic belt:** (Sacro-iliac support)
Ind: Recurrence
(3) **Arthrodesis:**
Ind: Unduly mobile, weak, painful joint

(B) INFECTIVE ARTHRITIS:

Etio: Adolescents or adults
Influenza or other infections

Clinic: (*a*) Signs of inflammation
(*b*) Radiography: no bone changes
(*c*) No abscess or sinus

Diff. diag. (*a*) Traumatic joint
(*b*) Tuberculous joint
(*c*) Osteoarthritic joint

(C) TUBERCULOSIS:

Etio: Adults

Path: Origin: osseous

Clinic: (1) Pain: (*a*) Local
(*b*) Sciatic
(2) Limping
(3) Tenderness: (*a*) Local
(*b*) On lateral pressure
(4) Boggy swelling: (*a*) External
(*b*) Internal: P. R. or P. V.
(5) X-Ray: fluffy outline of bones + rarefaction

Treat: (1) Conservative: Plaster-of-Paris fixation
(2) Operative: (*a*) Aspiration of cold abscesses
(*b*) Exposure and scraping
(*c*) Arthrodesis

(D) OSTEOARTHRITIS:

Clinic: (1) Pain: (*a*) Local
(*b*) Sciatic
(2) Limping
(3) X-Ray: osteophytes

(E) OPERATIONS:

Arthrodesis:

Ind: T. B.
Osteoarthritis

(A) **Intra-articular; Smith-Peterson**

Tech. (1) Incision Along posterior two-thirds of iliac crest
↓ Round the posterior superior spine
↓ Parallel to gluteus maximus
(2) Exposure and clearing the outer aspect of ilium
(3) Erasion of the joint
(4) Bone-graft from dorsum ilii counter-sunk in sacral socket
(5) Closure

(B) Extra-articular:
(1) Verrall's operation:

Preoper: Plaster bed

Oper: (*a*) Semilunar skin flap
(*b*) Exposure of posterior superior skin flaps
(*c*) Removal of sacral spines
(*d*) Tunnel in ilium in front of posterior sacral spines
(*e*) Tibial bone-graft insertion
(2) Key's Arthrodesis:
(*a*) Gluteal incision. midline towards greater trochanter
(*b*) Reflection of origins of gluteal muscles
(*c*) Exposure of the joint
(*d*) Iliac graft. between posterior superior spine and sacrosciatic notch

After-treat. (1) Plaster fixation for three months
(2) Pelvic brace for one year more

(9) HIP JOINT:

(A) CONGENITAL:

(1) CONGENITAL DISLOCATION OF THE HIP:

Etio: Heredity
Girls (80%)
Breech presentation: thighs flexed and adducted

Cause: (1) **Intrauterine breech presentation**
↓ Thighs flexed and adducted
↓ Flat acetabulum
or (2) **Lack of development of iliac part of acetabulum**

↓ Congenital subluxation
↓ Exaggeration by weight bearing

Path: Varieties: (1) **Posterior**: Dorsum ilii
- (*a*) **Postero-dorsal**
- (*b*) **Marginal**
- (*c*) Vertical

(2) Anterior . below ant. sup. iliac spine

Morb. anat: Nature of changes: (*a*) Congenital
- (*b*) Accommodative
- (*c*) Wear and tear

(1) Femoral head:
- (*a*) Alteration in shape
- (*b*) Alteration in level
- (c) Displacement:
  - (1) Upwards: shortening of the limb
  - (2) Backwards: lordosis
  - (3) Outwards . rolling gait

(2) Femoral neck: (*a*) Alteration in angle:
: Coxa vara
(*b*) Anteversion 35° to 90°

(3) Trochanter major: elevation

(4) Acetabulum: (*a*) Flat
(*b*) Deficient iliac part

(5) Dorsum ilii: false acetabulum

(6) Capsule: hourglass contraction

(7) Ligaments: contractures

(8) Compensatory: (*a*) Lordosis or scoliosis
(*b*) Genu valgum

Clinic:

(A) **Predislocation stage:** 3 or 4 weeks after birth
- (*a*) When the child is made to sit up, it falls sideways
- (*b*) Hip joint resists abduction beyond 45°
- (*c*) Absence of head in the groin
- (*d*) Eversion of the leg
- (*e*) Asymmetry of the waist, nates and thighs
- (*f*) X-Ray . flat socket

(B) **Dislocation stage:**
- (1) Symptoms: limp with waddling or scissor gait
- (2) Inspection:
  - (*a*) Spinal deformity: (α) Scoliosis
    (β) Lordosis
  - (*b*) Hip deformity: flexion + adduction
  - (*c*) Trochanter: elevation
  - (*d*) Knee: knock knee
  - (*e*) Leg: shortening

- (f) Perineum : broadening
- (g) Line of the body :
  - : Line of trunk anterior to the front of thigh

(3) Palpation :

- (a) Loss of resistance in the Scarpa
- (b) Femoral head on dorsum ilii
- (c) Great trochanter : elevated
  prominent

(4) Movements :

- (a) Restriction of : (α) Extension
  (β) Abduction
  (γ) Rotation
- (b) Exaggeration of : (α) Adduction
  (β) Flexion
- (c) Presence of : telescopic movements

(5) Measurements :

- (a) Shortening of the limb :
  - : Ant. sup. spine to medial malleolus
- (b) Elevation of trochanter :
  - (1) Nelaton's line
  - (2) Bryant's triangle
  - (3) Shoemaker's line
  - (4) Chiene's parallels
  - (5) Morris' bitrochanteric test
  - (6) Trendelenburg test :
    : Standing on affected leg
    ↓ Lowering of pelvis on sound side

(6) X-Rays.

- (a) Shape of acetabulum
- (b) Shape and position of femoral head
- (c) Neck :
  - (α) Coxa vara with anteversion
  - (β) Interruption of Shenton's line
  - (γ) Abnormal epiphysial centre

Diff. diag : (1) Acute arthritis
(2) Infantile paralysis
(3) Pseudo-hypertrophic muscular paralysis
(4) Rickety deformities

Treatment :

(1) Predislocation stage : age : 3 to 4 weeks
Braur's treatment : Retentive apparatus
+ Active movements

(*a*) Hips maintained in full abduction by braces
(*b*) All movements allowed except:
: Adduction and extension

(2) **Reduction stage: age: 1-3 years**
(*a*) **Manipulative reduction**
+(*b*) **Plaster-of-Paris in corrected position**

(A) **Putti:**

Ind: Upto twelve months
Tech: (1) Gradual forcing of the lower limb into:
(*a*) Maximum abduction
+(*b*) Inversion
(2) Fixation: by: 'broad-arrow' perineal splint
for: 8 to 12 months
(3) Daily passive movements

(B) **Lorenz:**

Ind: Ideal: Below three years
Unilateral: Below nine years
Bilateral. Below six years

Tech: (1) **General anæsthesia**
(2) **Passive stretching of:**
: Flexors, extensors, adductors
(3) **Reduction:**
(*a*) Abduction of flexed thigh:
: (Over a cushion behind the trochanter)
or (*b*) Traction away from the joint:
with: Thigh fully flexed + adducted + inverted
Reduction is shown by:
(*a*) Click
(*b*) Head felt in scarpa
(c) Tense hamstrings
(4) **Stretching of adductors and capsule**
(5) **Fixation**
In: (A) **Lorenz position:**
(*a*) Right angled abduction: 90°+90°
+(*b*) Eversion
(B) **'Knee in the axilla'** position
(C) **Lange position:**
(*a*) Right angled abduction: 90°+90°
+(*b*) Inversion
(D) **Neutral position:**
Different positions:
(A) Hip: (*a*) 90°+70°
(*b*) 90°+90°
(*c*) Knee in axilla

(B) Patella: (*a*) Looking out: Lorenz
(*b*) Looking in: Lange
(*c*) Looking front: neutral
(C) Knee: flexion 90°

By: Plaster-of-Paris

Extent: Lower part of the chest
↓ Affected ankle + upper opposite thigh

For: 6 to 10 months:
(Leg and knee for 2 months)

At: 3 monthly renewals

(6) **Locomotion and weight bearing:**

(A) Early: (*a*) Unilateral: 2–4 weeks
(*b*) Bilateral: 8 weeks

(B) Late:
(*a*) Plaster fixation: for 6 to 10 months
↓ (*b*) Night splint with Massage and exercises } for 6 months
↓ (*c*) Walking: 12 to 18 months after reduction

(C) **Average time for walking: 2 to 10 months**

(3) **Open operation stage:**
(1) **Age: 3 to 6 years**
(2) **Mechanical hindrance to reduction**
(3) **Acetabular defect** (recurrence after reduction)

Ind: (1) Hourglass contracture of the capsule
(2) Reinforcement of acetabular lip
(3) Reconstruction of acetabulum

(A) **Open reduction:**

Ind: (*a*) Age 3–6 years
(*b*) Failure of closed reduction

Preoper: 3 weeks before.
(*a*) Weight extension in abduction
(*b*) Stretching and manipulations of adductors
or (*c*) Tenotomy of adductors

Operation: (1) Incision: Smith-Peterson
(2) Vertical incision of capsule
(3) Reduction of dislocation
(4) Horizontal sewing of capsule

Post-oper: Fixation:
In: Abduction
By: Plaster-of-Paris
For: 6 months

(B) **Acetabular reconstruction:**

Ind: (*a*) Relapse after reduction in a child under 6 years

(*b*) Marginal dislocation in a child from 3 to 6 years

(1) **Shelf operation:**

(A) **Fairbank:** Dorsum ilii graft

(B) **Albee:** Ilium split with gap-fill graft

(2) **Reconstruction operation: Colonna**

Ind: Age over 6 years

Proper: (*a*) Manipulative mobilization under anæsthesia

(*b*) Division of adductor tendons

(*c*) Weight traction: 10–15 lbs.

For: (α) Three weeks

(β) Till X-Ray evidence of head opposite the acetabulum

Tech: (1) Incision: along the iliac crest

↓ greater trochanter

↓ down and back

(2) Reflection of trochanteric tip

(3) Division of hourglass contraction of capsule

(4) Hollowing out the acetabulum

(5) Placing the femoral head in acetabulum

(6) Reattachment of trochanteric tip

After-treat: Plaster spica in moderate abduction

(4) **Late palliative stage:** (*a*) **Age above 9 years**

(*b*) **Painful osteoarthritis**

(A) **Anterior conversion:**

Ind: Age: 9 to 18 years

Tech: Stage one:

: Adductor tenotomy + Skeletal traction

Stage two:

(1) Hyperextension + abduction: hip

↓ (2) Plaster fixation for six months

(B) **Anteversion of neck:**

: **Subtrochanteric osteotomy**

(C) **Abduction contracture:**

(*a*) Subtrochanteric osteotomy

(*b*) Open capsulotomy

(D) **Late painful unreduced cases:**

(1) **Excision of femoral head**

↓ Fixation:

In: Extension and abduction

By: Plaster-of-Paris

For: Three months

(2) **Arthrodesis of the hip:**

(3) **Lorenz's bifurcation osteotomy:**

Tech: (*a*) Incision: below the great trochanter
(*b*) Osteotomy: below trochanter minor
(*c*) Shaft levered inwards into empty socket

After-treat: (*a*) Fixation:
In: Abduction+slight inversion femur
Flexion of the knee
By: Plaster-of-Paris
For: 3 months
With Walking at the end of 3 weeks
(*b*) Physiotherapy and exercises

Complications: (1) Pseudo-coxalgia
(2) Osteoarthritis
(3) Instability
(4) Ankylosis
(5) Pain
(6) Recurrence

(2) **Congenital protrusio acetabuli:**

Path. Irregular enlargement of acetabulum
+Femoral head deeply buried

Clinic: (*a*) Limited hip movements
(*b*) Flexion of the hip
(*c*) Forward tilt of the pelvis
(*d*) Lordosis

Signs: (*a*) Interruption of Shenton's line
(*b*) Short limb

Compl: (*a*) Vulnerability to injury
(*b*) Osteoarthritis

Treat: (*a*) Manipulations → weight extension
(*b*) Smith-Peterson acetabuloplasty

(B) TRAUMA:

TRAUMATIC DISLOCATION OF THE HIP:

Etio: (1) Falls from great height in young musculars
(2) Dash–board motor accidents
(3) Falling roof
(4) Excessive traction for fracture femur

Etio: varieties: (1) **Abduction dislocations:**

(A) **Posterior:**
: Abduction of flexed and inverted femur

(B) **Anterior:**
: Abduction of extended and everted femur

(2) **Adduction dislocation:**
: Dorsal dislocation + fracture acetabular rim

at. varieties: (1) **Irregular:** Torn Bigelow → recurrence

(2) **Regular:**

(A) **Posterior:**

(*a*) **Dorsal:** Above obturator int. : 50 %

(*b*) **Sciatic:** Below obturator int. : 25 %

(B) **Anterior:**

(*a*) **Obturator:** Upon obturator ext. : 15 %

(*b*) **Pubic:** Upon pubic ramus : 10 %

(C) **Central:** Fracture acetabular floor
Femoral head in pelvis

Clinic:

(A) **Posterior:**

(1) **Dorsal:**

(*a*) **Decubitus:**

(1) Thigh: adduction + inversion + flexion
: Crosses above the other knee

(2) Great toe: on dorsum foot

(*b*) **Locking of the hip:**
In: Adduction+inversion+flexion

(*c*) Shortening of inferior extremity

(*d*) Local exam:

(1) Elevation of trochanter

(2) Relaxation of ilio-tibial band

(3) Displaced femoral head:

(α) Absence from scarpa

(β) Presence over dorsum ilii

(*e*) Sciatica

(2) **Sciatic:** Same as in dorsal but less exaggerated:

(*a*) Thigh crosses at the other knee

(*b*) Great toe at the root of the other great toe

(*c*) Less shortening

(B) **Anterior:**

(1) **Obturator:**

(*a*) Decubitus:
: Abduction + eversion + extension

(*b*) Locking of the hip:
In: Abduction + eversion + extension

(*c*) Lengthening of inferior extremity

(*d*) Local examination:
: Femoral head on obturator externus

(*e*) Obturator neuralgia

(2) **Pubic:** Same as in obturator: but
- (*a*) Shortening of inferior extremity
- (*b*) Femoral head on pubic ramus
- (*c*) Great trochanter replaced by depression
- (*d*) Femoral neuralgia

(C) **Central:**
- (1) Absolute immobility of hip joint
- (2) Shortening of the inferior extremity
- (3) Rectal examination
- (4) X-Rays: Ilio-pectineal line tilted inwards

(D) **Irregular:** (*a*) Freer excursions
(*b*) Easy reduction
(*c*) Easy recurrence

Compl: (1) **Abnormal dislocation:**
- (*a*) Fracture-dislocation: fractures of
  - (1) Acetabulum
  - (2) Femoral head
  - (3) Femoral neck
  - (4) Femoral trochanters
  - (5) Femoral upper shaft
- (*b*) Unreduced dislocation
- (*c*) Recurrent dislocation
- (*d*) Complicated dislocation: sciatica
  sciatic paralysis

(2) **Avascular necrosis of femoral head:**
- (*a*) Complete disintegration
- (*b*) Degenerative osteoarthritis
- (*c*) Epiphysial coxa plana

(3) **Myositis ossificans:**

Treatment:

(A) **Recent dislocations:**
(1) **Manipulative reduction**
or, (2) **Traction reduction**

(1) **Posterior dislocation:**
(I) (*a*) Deep anæsthesia
(*b*) Fix the pelvis
(*c*) Manipulations:
Bigelow manipulations:
: Flexion of the hip and knee
↓ Adduction + inversion of thigh
↓ Quick external circumduction + extension
i.e. (*a*) **Lift up + bend in + roll in**
↓ (*b*) **Circle out + straighten**

or, (*d*) Direct traction on limb with hip at right angle

or, (II) Weight traction in the axis of displaced femur

(2) **Anterior dislocation:**

(I) (*a*) Deep anæsthesia

(*b*) Fix the pelvis

(*c*) Manipulations:
: Flexion in abduction
↓ Internal circumduction + extension

i.e. (1) **Lift up + bend out + roll out**
↓ (2) **Circle in + straighten**

or, (*d*) Manual traction with hip at right angle

or, (II) Weight traction in the axis of displaced femur

After-treat:

(1) Legs tied together: for 10 days
Massage: immediate
Pass. move: 10–14 days
Act. move: 21–30 days
Weight bearing: 45–60 days

or, (2) Fixation:
In: Extension + slight abduction + neutral rotation
By: Plaster-of-Paris spica
Extent: Thorax to lower leg
For: Two months
With: Exercises of quadriceps + toes + ankle

(3) **Central dislocation:**

(1) Skeletal traction:
In: Abduction
By: Tibial tubercle pin
With: Braun's splint
For: Two months

(2) Operative reduction
: Through midline suprapubic incision

(B) **Old unreduced dislocations:** (1) **Osteotomy**
(2) **Arthrodesis**

(1) **Trochanteric osteotomy:**

Ind: (*a*) Shortening less than one inch
(*b*) No sciatic pressure

(2) **Open reduction** ⎫
↓ **Arthrodesis** ⎭ two stage operation

Ind : (*a*) Shortening more than one inch
(*b*) Sciatic pressure
(*c*) Osteoarthritis

(C) ACUTE ARTHRITIS:

Path. position : (*a*) Flexion : 40°
(*b*) Abduction : 40°
(*c*) Eversion

Swelling : Scarpa's triangle

Therapeutic position :
(*a*) Flexion : 20°–30°
(*b*) Slight abduction : 20°
(*c*) **Neutral rotation** or slight eversion

Causes : (1) Pyococcal : osteomyelitis neck of the femur
(2) Pneumococcal
(3) Typhoid

(D) TUBERCULOSIS OF THE HIP:

Etio : Before 20 . 5–20

Path : Origin : **Osseous**
(1) **Intra-articular femoral neck metaphysis**
↓ Synovial membrane
↓ Femoral head
↓ Acetabulum
(2) **Acetabulum**

Morb. anat : (1) Wandering acetabulum
(2) Flattened femoral head
(3) Pathological dorsal dislocation
(4) Tuberculous debris :
(*a*) Intra-articular
(*b*) Extra-articular :
(α) Antero-external
(β) Gluteal
(γ) Pelvic

Stages : (1) T. B. synovitis with effusion :
: Capacity posture
(2) Involvement of articular surfaces with muscle spasm :
: Spasm posture
(3) Articular disorganization :
: Dislocation posture
(4) Ankylosis :
: Ankylosis posture

Clinic:

(1) **History of neglected injury**
(2) **Limping:** Painful
(3) **Pain:**
  (a) Local
  (b) Referred: to knee
    (α) Continuous: distension
    (β) *On weight bearing: pressure*
    (γ) Starting: friction of raw bones
(4) **Tenderness:** On hammering the sole
(5) ***Deformity:***
  (A) **Stage of effusion: capacity posture**
    (1) Flexion: masked by lordosis
      Thomas'·sign
    (2) Abduction: masked by scoliosis
      (a) Lumbar convexity } to affected
      (b) Dorsal concavity } side
    (3) Apparent lengthening: masked by scoliosis
    (4) Eversion
  (B) **Stage of muscle spasm: spasm posture**
    (1) Flexion: masked by lordosis
    (2) Adduction: masked by scoliosis
      (a) Lumbar concavity } to affected
      (b) Dorsal convexity } side
    (3) Apparent shortening: masked by scoliosis
    (4) Inversion
  (C) **Stage of articular disorganization: Dislocation posture**
    (1) Flexion: masked by lordosis
    (2) Adduction: masked by scoliosis
    (3) Real shortening: masked by scoliosis
    (4) Inversion
  (D) **Stage of ankylosis: ankylosis posture**
    (1) Pathological posture: as in (C)
    (2) Therapeutic posture: optimum post.
(6) **Limitation of movements: In all directions**
  (a) Flexion: bend the thigh
  (b) Extension: prone → raise the thigh by leg
  (c) Abduction } from midline
  (d) Adduction } from midline
    (α) Affected thigh cannot cross the middle of the sound thigh
    (β) No tailor's position possible

- (*e*) Inversion
- (*f*) Eversion
  - (1) Flex hip and knee and rotate by leg
  - (2) Extend and roll the limb

(7) **Swelling**: Disappearance of groin fold

(8) **Muscular wasting**: Disappearance of gluteal fold

(9) **Mensuration**:

- (*a*) Int. malleolus to umbilicus: : Apparent shortening
- (*b*) Int. malleolus to ant. sup. iliac spine: : Real shortening
- (*c* Trochanteric measurements:
  - (1) Nelaton's line
  - (2) Bryant triangle
  - (3) Chiene's parallels
  - (4) Shoemaker's lines
  - (5) Morris' bitrochanteric measurements: : Distance to midline (More on affected side in path. disl.)
- (*d*) Round the thigh (for wasting)

(10) **Trendenlenburg's test + gait**

(11) **Rectal examination**

(12) **General health or other T.B. focus**

Complications:

(1) ***Cold abscesses*:**

- (A) External:
  - (*a*) Lateral
  - (*b*) Posterior
  - (*c*) Anterior
- (B) Internal:
  - (*a*) Iliac fossa
  - (*b*) Pelvirectal
  - (*c*) Ischiorectal

(2) **Sinuses**

(3) **Deformities**: Pathological dislocation

- (*a*) Flexion + adduction + inversion + shortening
- +(*b*) Lordosis and scoliosis

Diff. diag:

(1) **Other types of arthritis:**

- (*a*) Congenital dislocation
- (*b*) Traumatic arthritis

(c) Infective arthritis
(d) Osteoarthritis
(e) Hysterical arthritis

(2) **Bone conditions:**
(a) Pseudo coxalgia
(b) Slipped epiphysis
(c) Gummatous epiphysitis
(d) Acute osteomyelitis
(e) Coxa vara
(f) New growths

(3) **Bursitis:** Subpsoas or subgluteal
(4) **Psoas abscess**
(5) **Spinal disease**
(6) **Sacro-iliac disease**
(7) **Sciatica**

Treat:

(A) **Conservative:**
(1) Weight extension in line of deformity
↓ (2) Weight extension in line of correct position
↓ (3) Plaster-of-Paris spica:
In: Correct position
For: Three months after clinical cure
↓ (4) Thomas' hip splint with crutches + patten
↓ (5) Gradual weight bearing:
Ind: (1) One year after clinical cure
(2) Bony union as shown by X-Rays

(B) **Operative:**
Ind: (1) Adult age
(2) Failure of one year of conservatism
(3) Relapse
(4) Sequestra
(5) Quiescent stage

Operations:

(1) **Extra-articular arthrodesis:**
Ind: (a) Early cases + adults
(b) Quiescent stage with slow recovery
(c) Help to conservative treatment
(d) Failure of conservative treatment
(e) Destruction of articular cartilage
(f) No gross bone lesion

(2) Excision of the joint
↓ Arthrodesis in abduction
↓ Subtrochanteric osteotomy

(3) Disarticulation

(4) **Subtrochanteric osteotomy:**
Ind: Mal-ankylosis

Post. compl: (1) Tuberculous meningitis
(2) Amyloid disease
(3) Sinuses
(4) Secondary sepsis

(E) *OSTEOARTHRITIS OF THE HIP:*
Morbus coxæ senilis

Etio: Middle and later life

Causes: (A) Local:
(1) Previous trauma
(2) Infantile nutritional diseases
(3) Congenital dislocation and its forcible manipulation treatment
(4) Osteochondritis dissecans:
: Avascular necrosis
(5) Subacute infections
(6) Zymotic affections

(B) General:
(1) Toxæmia from local sepsis
(2) Neurogenic

Path: (See under Osteoarthritis)

Clinic: (1) Painful limping
(2) Crepitant and restricted painful movements:
(*a*) Flexion
(*b*) Abduction
(3) *Limb adducted + everted or inverted*
(4) Trochanter elevated
(5) Muscles wasted
(6) Sciatica

Treat: (1) **Early cases:**
(A) **Conservative:**
(1) Remove the primary focus
(2) Treat the etiology
(3) Local: positional
↓ protective apparatus
↓ physiotherapy

(B) **Camitz treatment:**
(1) Midline extraperitoneal obturator neurectomy
↓ (2) Manipulations and tenotomy of adductors

(2) **Late cases:**
(A) **Manipulations under anæsthesia:**
Ind: Pain not persistent
(B) Rest: **Walking plaster spica**

(C) **Arthrodesis:** Best
- (*a*) Intra-articular
- (*b*) **Extra-articular**
- (*c*) **Smith-Peterson pin**

(D) **Lorenz's bifurcation:** Very good

(E) **Smith-Peterson's excision of acetabular edge** (acetabuloplasty)

(F) Arthroplasty

(G) Pseudarthrosis

(F) ANKYLOSIS OF THE HIP:

Cause: Any kind of untreated arthritis

Path: *Position*: (1) *Flexion*: 40° (2) Abduction: 40° (3) Eversion } or { (1) Flexion (2) Adduction (3) Inversion

Therapeutic position: (1) Flexion: 20°–30°
(2) Abduction: 20°
(3) Neutral rotation

Treat: (1) Manipulations → movements
(2) **Weight traction:** (*a*) In axis of deformity
↓ (*b*) Optimum position
↓ **Plaster fixation** in optimum position
(3) Excision:
With: (A) Arthroplasty: Smith-Peterson (vitellum mould)
(B) Arthrodesis:
(4) **Extra-articular arthrodesis:**
Ind: (1) Removal of pain and instability
(2) T. B. ankylosis
(5) **Extra-articular osteotomy:**
: Gants' subtrochanteric
(Angle of abduction should not be more than 25°)

(G) OPERATIONS ON THE HIP JOINT

(1) Exposure of the hip:

(A) Anterior approach:

Ind: (1) Drainage of acute arthritis
(2) Removal of foreign or loose body
(3) Capsulotomy
(4) Albee's arthrodesis for painful osteoarthritis

Tech: (1) Incision: 4 inches long, downwards and slightly inwards, from half an inch below anterior superior iliac spine
(2) Split: (*a*) Tensor fasciæ femoris+glutei
From (*b*) Sartorius+rectus femoris

(B) Antero-external approach: (Smith-Peterson)

Ind: Open reduction of congenital hip dislocation in child

Tech: (1) Incision: (*a*) As in (A)

+ (*b*) Three inches along the iliac crest

(2) Strip tensor fasciæ and glutei from ilium

(3) Detach straight head of rectus

(C) Lateral approach:

Ind: (1) Extra-articular arthrodesis

(2) Intra-articular arthrodesis

(3) Arthroplasty

Tech:

(1) Spino-trochantero-femoral incision:

(*a*) Incision: anterior superior spine

↓ trochanter major

↓ along femoral shaft

(*b*) Dissect between: (α) Tensor fasciæ

& (β) Glutei

(*c*) Division of the great trochanter

(2) Murphy's Goblet incision:

(*a*) Incision: (α) Cup with trochanter as bottom

(β) Handle along the femoral shaft

Other steps as in (1)

(D) Posterior approach.

Ind: Reconstructive operations

Tech: (1) Incision: (*a*) Tip of the great trochanter

↓ towards posterior superior iliac spine

+ (*b*) Tip of the great trochanter

↓ along femoral shaft

(2) Gluteus maximus split

(3) Dissection between: (*a*) Deeper glutei

& (*b*) Pyriformis

(4) Division of great trochanter with muscle insertion

(2) Excision of the hip:

Ind: (*a*) Traumatic destruction of the joint

(*b*) Pathological dislocation

(*c*) Tuberculosis

(*d*) Ankylosis of the hip with thigh amputation

Tech: (1) Exposure of the joint

(2) Capsulotomy

(3) Excision of the affected constituent bones

(4) Arthroplasty or arthrodesis

(5) Closure

(3) Arthroplasty of the hip:

Ind: (1) Bilateral ankylosis of the hip

(2) Painful limited movements: osteoarthritis

(3) Infective or tuberculous ankylosis

Tech: (1) Incision: (*a*) Antero-lateral
or (*b*) Murphy's goblet

Method: (A) Classical: (*a*) Remodelling of acetabulum
(*b*) Remodelling of head
(*c*) Interposition of fascia lata

(B) Whitman:
Ind: (*a*) Arthritis: osteoarthritis
(*b*) Non-united neck fracture
Tech. (*a*) Removal of head of femur
(*b*) Pushing the neck into acetabulum
(*c*) Trochanter transferred lower down

(C) Colonna:
Ind: Non-united neck fracture
Tech: (*a*) Removal of head
(*b*) Use of trochanter or head of femur
(*c*) Reinsertion of trochanteric muscles lower down

(D) Smith-Peterson's Vitellum mould arthroplasty
Ind: Mal-ankylosis of the hip

(E) Smith-Peterson's acetabuloplasty:
Ind: (*a*) Protrusio acetabuli
(*b*) Senile osteoarthritis
(*c*) Slipped epiphysis
Tech: (1) Incision: anterior third of iliac crest
↓ along sartorius
(2) Muscle split: (*a*) Sartorius + iliopsoas
from (*b*) Tensor fasciæ
(3) Division of straight head of rectus
(4) Exposure of capsule
(5) Excision of superior acetabular edge and V shaped capsule

After-treat: Abduction and inversion for 3 weeks

(4) Arthrodesis of the Hip:

Ind: (1) Painful unilateral hypertrophic osteoarthritis
(2) Paralysis of all hip muscles
(3) Tuberculosis of the hip

Preoper: Plaster bed: lower thoracic margin
↓ whole of inferior extremity
& opposite knee

Operation:

(A) Intra-articular:

(1) Albee's open method:
: Tibial graft into the tunnel in the neck through anterior incision

(2) Smith-Peterson pin closed method:
: Fixation by long and strong pin through the neck into the head and acetabulum

(B) **Extra-articular: For T.B. hip**

: Formation of a bridge of bone between femur and ilium to prevent movements at the hip *joint*

Tech: (1) Lateral approach

(2) Methods:

(A) ***Shelf operation: Mathieu***

: Shelf of bone from ilium turned down to trochanter major

(B) **Trochanter graft: Hibb**

: Part of greater trochanter separated, rotated and contacted with dorsum ilii

(C) **Femoral or tibial graft:**

(α) Between dorsum ilii and greater trochanter **(Hey groves)**

(β) Between ischium and greater trochanter **(Trumble)**

After-treatment of hip operations:

(A) **Arthrodesis:**

Fixation:

In: Optimum position:
Flexion: 20°–30°
Abduction: slight (20°)
Eversion: slight

By: Plaster-of-Paris

Extent: Lower edge of the thorax
↓ Toes
↓ Opposite ant. sup. spine
↓ 6" of opposite thigh (for 3 weeks)

After: 10 days
For: 3 months

(B) **Arthroplasty:**

(1) ***Classical:***

1st day: (*a*) Extension to the leg: 20 lbs.
+ (*b*) Plaster spica from ribs to ankle over (*a*)

10th day: Bivalve the plaster
Active movements

7th week: Weight bearing

(2) **Whitman:**

(*a*) Fixation:
In: Optimum position
By: Plaster-of-Paris
For: 6 weeks

↓ (*b*) Assisted active movements:
: (abduction + extension)

(3) **If repeated access to wound is required:**
Fixation:
In: Optimum position
By: Thomas' abduction frame

After any operation on hip joint, wear walking calliper for some months after operation, before full weight is taken on the limb

(10) KNEE JOINT:

(A) CONGENITAL: (1) Dislocation of the patella
(2) Abnormal ext. semilunar cart.

(B) TRAUMA:

(I) **Sprain: Traumatic synovitis;**
: Rest + cold → strap + counter-irritant
(See under internal derangement)

(II) **Dislocation:**

(A) **Knee joint:**

Varieties: (1) **Lateral:** Traumatic subluxation
(2) **Forward:**
: Associated with rupture of ant. crucial lig.
(3) **Backwards:**
: Associated with rupture of post. crucial lig.
(4) **Triple:** Flexion
+Eversion
+Backward subluxation
Cause: Pathological disorganisation

Compl. Pressure on popliteal vessels
↓ Gangrene leg

Treat: (1) Manipulative reduction:
: Flexion + traction + manipulations
↓ (2) Fixation:
In: Optimum position
For: Three weeks
↓ (3) Active movements: after 3 weeks
↓ (4) Weight bearing: after 6 weeks
↓ (5) Knee brace: for 6 months

(B) **Patella:**

Etio: (1) Congenital
(2) Direct traumatic
(3) Muscular violence: in genum valgum
(4) Rupture of patellar ligament
(5) Hypotonic quadriceps
(6) Loose capsule

Varieties: (A) **Outwards**: Lateral
(B) **Inwards**: Medial
(C) **Rotatory**
(D) **Habitual** slip

Clinic: (1) Broadening of the knee joint
(2) Patella in abnormal position
(3) Intercondyloid notch palpable
(4) Joint effusion

Compl: (1) *Recurrence*
(2) Osteoarthritis

Treat: (1) **Manipulative reduction**:
: Flexion of the hip
\+ Extension of the knee
\+ Local manipulations
↓ Fixation:
In: Optimum position
By: Posterior splint
For: Two months

Operative:
Ind: (*a*) Pathological dislocation
(*b*) Recurrent or habitual dislocation

Operation:
(A) Lateral:
(*a*) Excision of capsular ellipse
(*b*) Robert Jones:
: Transplantation of tibial tubercle with ligamentum patellæ to the inner side + plication of inner side of the capsule
(*c*) Albee: Raising a ridge on outer femoral condyle
(*d*) Fixation of patella to inner side by fascial graft
(*e*) Transplantation of semitendinosis into the patella
(*f*) *Transplantation of lateral half of the patellar* tendon behind the medial half into the tibia, on inner side (Goldthwait)
(*g*) Elmslie:
Robert Jones' opn. + suturing a portion of vastus medialis around the qudriceps above the patella
(B) Medial:
(*a*) Insertion of iliotibial band into the outer edge of patella
(*b*) Plication or semilunar excision of outer part of the capsule
(C) Secondary to genu valgum:
: Femoral supracondylar osteotomy

After-treat: (of operative treatment for dislocation patella)

(1) Immobilisation in plaster: for 8 weeks
(2) Physiotherapy and movements:
: (a) Quadriceps drill: immediate
(b) Walking: after 4 weeks
(c) Knee flexion: after 8 weeks
(3) Palliative: (a) Permanent knee truss or crepe bandage
+ (b) Quadriceps drill

(III) Fracture-dislocations:

Dislocation of the knee associated with fractures:
: (a) T or Y condylar femoral
(b) Patella
(c) Tibial tuberosities and spine

(IV) Internal derangements of the knee:

Def: Intra-articular lesions due to trauma in a previously healthy knee joint, rendering it liable to **recurrent attacks of: sudden pain + synovial effusion**

Etio: Predisposers:

(A) **Anatomical:**
(a) Inward angling
↓ Assymmetric weight bearing
(b) Flat and loose articulation
(c) Tension on cruciate ligaments
(d) Redundency of synovial mem.
(e) Loculations in the joint
(f) Semilunar cartilages

(B) Sports and outdoor occupations

Exciting cause: **A strain or a twist**

Varieties:

(1) **Traumatic synovitis and hæmarthrosis:**

(A) **Traumatic synovitis:**

Etio: Strain or twist

Clinic: Synovial effusion

Treat: (a) Mild: crepe bandage with Scott's ointment
(b) Severe: (α) Fixation:
In: Optimum position
By: Back splint
For: Ten days
↓ (β) Crepe bandage with Scott
↓ (γ) After-treatment:
Massage: } immediate
Quadriceps drill: } immediate
Weight bearing: after 3 weeks

(B) Recurrent synovitis:

Etio: (*a*) Nipped synovial fringes: due to
(α) Quadriceps inefficiency
(β) Synovial œdema
(γ) Osteoarthritis

Clinic: Recurrent painful effusion

Diff. diag: (*a*) Semilunar cartilage injury
(*b*) T. B. synovitis
(*c*) Syphilitic synovitis

Treat: Conservative with quadriceps drill

(C) Traumatic hæmarthrosis:

Etio: (*a*) Blow or twist
(*b*) Fracture tibial spine or patella
(*c*) Post-operative

Clinic: Rapid effusion with local and general inflammato reaction

Treat: (1) Aspiration
↓ (2) Crepe bandage with back splint
↓ (3) Quadriceps drill: after 10 days

(2) Trauma to lateral ligaments of the knee:

(A) Sprain of internal lateral ligament:

Etio: (1) Abduction of extended or slightly flexed kne
(2) Abduction and eversion of leg over thigh

Path: Tear of (*a*) Femoral attachment
(*b*) Tibial attachment
(*c*) Semilunar deep attachment

Clinic: (1) Local
: Pain + tenderness + swelling + ecchymosi
(2) Effusion into the joint

Diff. diag: Semilunar cartilage tear

Treat: (A): (*a*) Aspiration
+ (*b*) Hinged knee support

(B): Fixation:
In: Optimum position
By: Plaster cast
Extent: Top of the thigh to ankle
For: Three weeks

↓ (C) (*a*) Crepe bandage
+ (*b*) Quadriceps drill
+ (*c*) Sole elevation: medial and heel

(B) Rupture or avulsion of internal lateral lig.:

As in sprain
+ Excessive lateral mobility (20°–30° of abduction)

Treat: (1) (*a*) Fixation:
In: Optimum position
By: Plaster-of-Paris
Extent: Top of the thigh to ankle
For: 8 weeks
(*b*) Quadriceps drill
(2) Operative reconstruction:
Ind: Persistent lateral instability inspite of three months' quadriceps drill
Operations: (1) Suture of the rupture
(2) Shortening of lax ligament
(3) Tenodesis: by semitendinosus
After-treat: (*a*) Fixation in plaster for one month
+ (*b*) Quadriceps drill
↓ (*c*) Sole elevation: medial side
Compl: Steida's disease:
: Traumatic subperiosteal ossification at the femoral attachment

(C) Sprain, rupture or avulsion of ext. lateral lig.:
(As in internal ligament substituting adduction for abduction and sole elevation on lateral side)

(D) Ext. lateral lig. trauma+frac. fibular styloid:
Etio: Severe adduction at knee
Path: (1) Avulsion of external lateral ligament
+ (2) Avulsion of fibular styloid
+ (3) External popliteal nerve palsy
Treat: Open suture

(3) Injuries of the cruciate ligaments:

(A) Anterior cruciate ligament:
Anat: Tibial spine to external femoral condyle
Etio: (*a*) Hyper abduction
(*b*) Hyper extension
Clinic: **Excessive forward mobility** of tibia over femur when knee is extended

(B) Posterior cruciate ligament:
Anat: Tibial spine to internal femoral condyle
Etio: Blow over the front of the tibial head
Clinic: **Excessive backward mobility** of tibia over femur when knee is flexed
Treat: (Of cruciate ligament injuries)

(1) **Conservative:**

(A) Fixation:

In: (a) Anterior ligament:
: Knee flexed to 40°
Tibial head backwards

(b) Posterior ligament:
: Knee extended
Tibial head forwards

By: Plaster-of-Paris

Extent: Toes to groin

For: Three months

(B) Quadriceps drill: immediate
+Ambulation with crutches and patten

(2) **Operative reconstruction:** By fascia lata

Ind. Failure of conservative treatment

Tech: (a) Good exposure
(b) Drilling of femur and tibia
(c) Fascial strip

After-treat: (1) Fixation:
In: Knee in 160°
By. Plaster-of-Paris
For: 6 weeks
↓ (2) Physiotherapy and knee cage

(4) **Fracture of tibial spine:**

Etio: 10–20 years

Cause: (a) Hyperabduction
(b) Hyperextension
(c) Blow to the front of flexed knee driving the femur back

Path: Associated with rupture of ant. cruciate lig.

Clinic: (1) Rapid hæmarthrosis
(2) Forward mobility of tibia
(3) Limitation of terminal 15° of extension
(4) X-Rays

Treat: (1) Manipulative reduction
(2) Open reduction:
Tech: Incision outer side of lig. patellæ
↓ Division of ant. horn of ext. semilunar
↓ Reposition of fragment

After-treat: (A) Fixation:
In: Extension
By: Plaster-of-Paris
For: Six weeks
+ (B) Quadriceps drill

(5) **Dislocation of the knee:** (See under Dislocation)

(6) Semilunar cartilage abnormalities:

(A) Congenital:

Varieties: (1) Disc cartilage: (external)
(2) Irregular thick fibrocartilage: (external)

Clinic: (1) History of knee trouble from childhood
(2) Snap on the outer side of the joint during extension, heard and felt

Treat: Removal of the cartilage

(B) Tears of the semilunar cartilages:

Etio: (1) **Internal:** Weight bearing **external rotation and abduction** of tibia in a flexed knee
(2) **External:** Weight bearing **internal rotation and adduction** of tibia in a flexed knee

Predisp: (*a*) Undue laxity of cartilages
(*b*) **Footballers**, miners, carpet layers

Frequency: **Internal**: External : : 8 : 1

Path: Varieties: (1) Central displacement with **locking:**
: Longitudinal: (*a*) Bucket-handle
(*b*) Peripheral
(2) **Non-locking:**
(*a*) Posterior horn tears
(*b*) Central tears
(*c*) Anterior horn tears

Clinic:

(1) **Internal semilunar cartilage:**

(A) **Bucket-handle tear with locking:**

(*a*) Immediate:
(1) History of abduction-eversion strain
(2) Sickening tearing pain on inner side
(3) Locking in semiflexed position

↓ (*b*) Intermediate:
(4) Synovitis with effusion

↓ (*c*) Delayed:
(5) Subsidence with limited terminal extension

↓ (*d*) Exacerbation:
(α) Slight recurrent effusion
(β) Vastus wasting
(γ) Disability

+ (*e*) Tenderness: midway between:
(α) Inner margin of lig. patella
+ (β) Inner tibial tuberosity

(*f*) X-Ray: Negative

(B) **Posterior horn tear without locking:**
  (a) History of abduction-eversion strain
  (b) Sensation of insecure joint
  (c) No locking
  (d) McMurray's click:
  In: Postero-internal compartment
  When: (α) Tibia is: inverted and everted
  or: abducted and adducted
  (β) Slow extension of knee from full flexion with leg everted and abducted

(2) **External semilunar cartilage:**
  (a) History of adduction-inversion strain
  (b) Effusion in the joint
  (c) Pain and tenderness on outer side
  (d) Limitation of terminal extension
  (e) McMurray's click:
  On (α) Adduction, inversion and gradual extension of fully flexed tibia (post. horn)
  (β) Active extension: (ant. horn)

Diff. diag: (1) Arthritis: tuberculous or traumatic
  (2) Loose body
  (3) Lateral ligament lesions
  (4) Synovial nipping
  (5) Cruciate ligament lesions
  (6) Intra-articular fractures

Treat:

(1) **Conservative:**
  Ind: (a) Normal knee joint with history of **one attack**
  (b) **Elderly patient** with:
  (1) History of recurrent attacks
  +(2) Arthritis
  +(3) No locking
  Tech: (A) (1) **Pressure bandage**
  +(2) Quadriceps drill+faradism
  (B) (1) **Manipulative reduction:**
  Ind: Locking: (Internal cart.)
  Tech: { Full flexion of the knee
  { +External rotation of the leg
  Local pressure
  ↓ { Sudden extension of the knee
  { +Sudden internal **rotation** of the leg

(2) Fixation:
In: Extension
By: Back splint
For: 4 weeks
With: Massage and quadriceps drill

(2) **Operative excision:** (See under operations)

Ind: (1) Recurrent locking
(2) Failure of manipulations
(3) Bucket-handle tears
(4) Traumatic osteoarthritis

(C) **Cysts of the semilunar cartilages:**

Etio: Males between 20 and 40
External cartilage

Path: (*a*) Congenital
(*b*) Mucoid degeneration due to contusion of meniscus

Clinic: (*a*) History of trauma
(*b*) Painful swelling on the lateral side
(*c*) X-Ray: pressure atrophy of outer condyle of tibia

Treat: Excision of the cyst with the cartilage

(7) **Loose bodies in the knee:** Joint mice

Path: **Fisher's classification:**

(A) Loose bodies in pathological joints:
(1) Osteoarthritis: osteophytes
(2) Charcot joint: osteophytes
(3) Tuberculosis: articular cartilage
(4) Acute infective arthritis: art. cartilage

(B) Loose bodies in apparently normal joints:
(1) Osteochondritis dissecans:
: Art. cartilage and bone
(2) Semilunar cartilage pieces
(3) Detached epiphysis

(C) Synovial chondromata

Nature of loose bodies:
(1) Osteophytes
(2) Chondrophytes
(3) Synovial villi
(4) Loose articular cartilage
(5) Loose semilunar cartilage
(6) Loose melon-seed bodies
(7) Loose fractured bone pieces

Clinical groups:
(1) Palpable painless loose body
(2) Locking joint

(3) Problematical knee:
: Recurrent painful locks with effusion
(4) Pseudo internal semilunar cartilage lesion
(5) Osteoarthritis
(6) X-Ray evidence

Compl: (*a*) Osteoarthritis
(*b*) Disintegration of the joint

Treat: (1) Removal
(2) Synovectomy (in synovial chondromata)

(8) Lipoma Arborescence:

Etio: Obesity
Osteoarthritis
Weak quadriceps

Path: Diffuse lipoma behind the ligamentum patella

Clinic: (1) Pain behind and on both the sides of lig. patella
(2) Swelling behind and on both the sides of the lig.
(3) Painful extension + painless flexion
(4) Recurrent effusion

Treat: (1) Conservative:
(*a*) Physio and electro therapy of quadriceps
(*b*) Knee cage: to prevent full extension
(2) Operative: excision

(9) Rupture of the extensor apparatus of the knee:

Etio: Powerful involuntary muscle contraction:
: Regaining balance in a fall

Clinic: (*a*) *History*
(*b*) Snap
(*c*) Hæmarthrosis
(*d*) Loss of active extension of the knee
(*e*) Gap

Varieties:

(A) Suprapatellar: Avulsion of the quadriceps: Rectus femoris aponeurosis

Etio: Elderly

Path: (*a*) Partial
(*b*) Complete

Clinic: (*a*) Painful swelling of the knee
(*b*) Limited extension of the knee
(*c*) Palpable suprapatellar gap

Compl: Myositis ossificans

Treat: (A) Partial: fixation in backsplint for two weeks
↓ crepe bandage
(B) Complete:

Operation: (*a*) Suture of the tendon to patellar aponeurosis

↓ After-treat: Rest in plaster shell for 6 weeks:

with: (*a*) Faradism: after 10 days
(*b*) Allowed up: after 15 days
(*c*) Active exercises: after 21 days
(*d*) Walk in plaster: after 30 days
(*e*) Removal of plaster: after 45 days

(B) **Transpatellar: Rupture of the tendon with fracture patella**

(See fracture patella)

(C) **Infra patellar:**

(*a*) **Avulsion of lig. patellæ from patella**

(*b*) **Rupture of lig. patella midway**

Clinic: (1) Loss of extension
(2) Upward displacement of patella

Compl: Myositis ossificans traumatica

Treat: (A) Suture of the tendon
(B) Fascial reconstruction of the tendon
Ind: Old cases

After-treat: Fixation:
In: Extension
By: Plaster-of-Paris
For: 8 weeks

(D) **Fracture tibial tubercle:**

or: **Separation of tibial tubercle epiphysis**

with: **Quadriceps extensor insertion**

(*See under tibial fractures*)

(C) ARTHRITIS OF THE KNEE:

(1) TRAUMATIC SYNOVITIS:

Etio: (1) Sprain
(2) Dislocation
(3) Fracture dislocation
(4) Internal derangement

(2) INFECTIVE ARTHRITIS:

Path. position: (1) Flexion 45°
(2) Triple displacement: Flexion
Eversion
Backward displacement

Swelling: (1) Subcrural pouch
(2) Patellar hollows

Special sign: Patellar tap
Therapeutic position: (1) Straight: after excision
(2) Flexion: 5°–10°
Special treatment: Disarticulation by open method
(See under Infective Arthritis)

(3) GONOCOCCAL ARTHRITIS:
(See under joints)

(4) SYPHILITIC ARTHRITIS: (See under joints)
- (1) **Clutton's joints**
- (2) **Secondary symmetrical bilateral hydrarthrosis**
- (3) **Secondary monarticular plastic arthritis + periarthritis**
- (4) **Tertiary local synovial gumma or gummatous synovitis**

(5) TUBERCULOSIS OF THE KNEE:

Etio: Age: 20 years
Incidence: Second to spine

Path: Origin: (*a*) Synovial: non-focal
(*b*) Osseous: extra-articular focal
(α) Femur
(β) Tibia

Clinic: (A) **Tumour albus:**
- (1) Pulpy white synovial thickening
- (2) Muscular wasting
- (3) Spindle-shaped joint
- (4) Limited painful movements

(B) **Localized nodular synovial T.B.:**
: ('Riedel' or 'Konig')
- (1) Young girls
- (2) Nodular synovial thickening
- (3) Marked effusion
- (4) Free and painless movements

(C) **Tuberculous hydrops of the knee:**
: Marked effusion with melon-seeds

(D) **Tuberculous empyema of the knee:**
: Distension with tuberculous debris

(E) **Pathological dislocation:**
(1) Flexion
\+ (2) Eversion
\+ (3) Backward subluxation

Diff. Diag: (1) Acute traumatic arthritis
(2) Internal derangement
(3) Rheumatoid or osteoarthritis
(4) Syphilitic arthritis

(5) Gonococcal arthritis
(6) Tumours of constituent bones

Treatment:

(1) **Conservative:**

Ind: (1) Children: below 9 years
(2) Early cases
(3) Acute phase
(4) Synovial disease

Tech: (1) **Weight extension:**
In: The direction of deformity
By: Thomas' knee splint

↓ (2) Weight extension:
In: Corrected or optimum position
By: Thomas' knee splint

↓ (3) **Fixation:**
In: Correct position
By: Plaster-of-Paris

↓ (4) **Locomotion:**
In: Thomas' knee splint
With: Crutches and patten

↓ (5) **Weight bearing**

(2) **Operative:**

Ind: (1) Adults
(2) Late cases: failure of conservatism
(3) Chronic phase
(4) Osseous origin

Operations: (1) **Arthrectomy:** In children
(2) **Excision with arthrodesis:** In adults
(3) Amputation:
Ind: (*a*) Relapse after excision
(*b*) Septic sinuses
(*c*) Excessive shortening
(*d*) T.B. elsewhere
(*e*) Bad general health
(*f*) Waxy disease

(6) OSTEOARTHRITIS OF THE KNEE:
(See under general joints)

Clinical types: (1) Wet type: hydrarthrosis
(2) Dry type: osteophytes
(3) Intermediate type

(7) CHARCOT'S JOINT: (See under general joints)

Etio: Tabes dorsalis

Clinic: (1) Painless effusion with abnormal movements
(2) Tabetic signs

(8) LOOSE BODIES IN THE JOINT:
(See under internal derangements)

(9) ANKYLOSIS OF THE KNEE:
(See under general joints)

Path. position: (1) Flexion 45°
(2) Triple subluxation: Flexion
Eversion
Backward

Therapeutic: (1) Flexion 5°–10°
(2) Full extension: after excision

(D) OPERATIONS ON THE KNEE:

(1) **Arthrotomy:**

Ind: (A) **Drainage:**
: Septic arthritis
(B) **Exploration:**
(*a*) Penetrating wounds
(*b*) Foreign and loose bodies
(*c*) Diagnostic: (Biopsy)
(C) **Minor therapeutic steps:**
: Etherization

Sites: (A) Drainage: Lateral incisions on either side of ligamentum patellæ
(B) Exploration: (*a*) In front of biceps
(*b*) Between semimembrinosus and semitendinosus

(2) **Exposure of the joint:**

Ind: Intra-articular lesions:
(*a*) Removal of: Hypertrophied villi
Osteo and chondro phytes
Loose cartilage
(*b*) Synovectomy
(*c*) Exploration and excision or reconstruction
Of: Semilunar cartilages
Cruciate ligaments

Tech: (A) **Old classical method:**
: Horseshoe flap containing:
(1) Patella
(2) Tibial tubercle
(B) **Robert Jones' split patella method:**
(*a*) U shaped skin flap
(*b*) Vertical median division of:
(1) Quadriceps tendon
(2) Patellar capsule
(3) Ligamentum patella
(4) Patella
(5) Synovial membrane

(c) Retraction of the halves
(d) Catgut sutures at the end

(C) **Internal lateral incision of Fisher:**
(a) Incision along the inner side of patella and suprapatellar pouch
(b) Division of the fascia in midline
(c) Division of capsule and synovium ¼ inch internal to patella

(D) **External lateral incision:** (as in C)
Substitute: external for internal
: outer for inner

(3) Excision of the semilunar cartilages:
(1) Tourniquet
(2) Position: right angled flexion of the knee
(3) Incisions:
(A) Anterior approach:
(a) Internal cartilage:
(α) Oblique over antero-internal compartment
or (β) Parallel to inner border of patella and patellar ligament
(b) External cartilage:
(α) Oblique over the antero-external compartment
or (β) Parallel to outer border of patella and patellar ligament
(B) Posterior approach:
Ind: (a) Posterior horn of internal cartilage
(b) Inability to remove whole cartilage by anterior route
(c) Recurrence after removal of anterior portion
Incisions: (1) Behind and parallel to int. lateral lig.
(2) Along the anterior border of sartorius one inch behind adductor tubercle
(4) Incision of the capsule, fat and synovium
(5) Detachment: anterior horn
↓ lateral border
↓ posterior horn
(6) Closure: synovium
↓ capsule
↓ skin

After-treat: (1) Pressure bandage + back splint: immediate
(2) Quadriceps drill + faradism: after 24 hours
(3) Movements of the joint: after 10th day
(4) Weight bearing: after 15th day
(5) Crepe bandage: till subsidence of effusion

(4) Synovectomy of knee joint:
Ind: (1) Osteoarthritis
(2) Non-suppurative chronic sclerosing synovitis

Tech : (*a*) Incision : lateral J
(*b*) Removal of tibial tubercle
(*c*) Incision of lateral portion of capsule
(*d*) Dissection of synovial membrane :
: Including supra-patellar pouch
: Excluding semilunars and cruciate lig.
(*e*) Fixation of tibial tubercle in place
After-treat : (1) Gutter splint for 2 weeks
↓ (2) Active movements

(5) Excision and arthrodesis of the knee :

Ind : (1) **Tuberculosis**
(2) Old infective arthritis
(3) Osteoarthritis
(4) Compound comminuted fracture
(5) Flail paralytic joint
(6) **Unsound ankylosis**

Contraind : Flexion more than a few degrees

Tech : (1) Raise U skin-capsule-patella flap
(2) Dissection of synovium with suprapatellar pouch
(3) Section of the bones :
(A) Femur : Children : only cartilage
Adults : ⅓rd of condyle
(At right angles to long axis)
(B) Tibia : thin slice
(4) Tubby's patellar peg :
: Section of deep surface of patella
Freshening ant. surfaces of femur + tibia
Patellar graft across
or, (4) Excise the patella
(5) Closure
(Sometimes use of bone-grafts or Wyeth's pins)

After-treat : (1) First day : Fixation :
In Optimum position : straight
By : Plaster-of-Paris
Extent : Foot to pelvis
(2) Tenth day : Bivalve the plaster
Removal of sutures
(3) Twenty-second day :
(*a*) Renewal of plaster from thigh to foot under anæsthesia
+ (*b*) Walking on crutches
(4) Sixty-first day :
(*a*) Moulded leather and celluloid case with lateral steels
+ (*b*) Weight bearing
(5) In T.B. : Thomas' knee splint + calliper
: For one year

(6) **Arthroplasty of the knee:**

Ind: (1) Mobility required
(2) Femoro-patellar ankylosis only

Contraind: (a) Children
(b) Tuberculosis

Tech: (1) Incision: long antero-lateral J
(2) Detachment of tibial tubercle
(3) Exposure of the joint
(4) Excision and shaping of bony ends
(5) Interposition of fascia lata
(6) Closure

After-treat: (1) Weight extension: 10 lbs.
In: Semiflexion
By: Gutter splint
For: Two weeks
↓ (2) Suspension:
From: Overhead frame
For: Four weeks
↓ (3) Walking: with calliper + exercises
↓ (4) Weight bearing: after 12 weeks

(II) ANKLE JOINT:

(A) TRAUMA:

(I) SPRAINS, DISLOCATIONS AND FRACTURE-DISLOCATIONS OF ANKLE;

(A) Inversion strains: with ext. lig. injuries

(1) **Sprain of external ligament:**

Def: Every inversion injury of ankle joint, which is stable, with negative X-Ray

Etio: Sudden inversion strain

Path: Stretching or tearing of a few fibres of external lig.

Clinic: (1) Local inflammatory ecchymosis:
: Below and in front of lateral malleolus
(2) No instability of the joint
(3) Negative X-Ray

Treat: (A) **Elastoplast:**
: Elastoplast in eversion + Non-weight bearing exercises } for 10 days
(B) **Leriche:**
: Periarticular 10 c.cs. of 2% novocain

Compl: (1) Adhesions
(2) Tuberculosis

(2) **Avulsion or tearing of external ligament with dislocation astragulus;**

Tech : (*a*) Incision : lateral J
(*b*) Removal of tibial tubercle
(*c*) Incision of lateral portion of capsule
(*d*) Dissection of synovial membrane :
: Including supra-patellar pouch
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+Non-weight bearing exercises } days
(B) **Leriche:**
: Periarticular 10 c.cs. of 2% novocain

Compl: (1) Adhesions
(2) Tuberculosis

(2) Avulsion or tearing of external ligament with dislocation astragulus:

Def: Inversion injury of the ankle joint with excessive lateral mobility of talus

Etio: Inversion strain

Path: (1) Complete avulsion of anterior and middle bands of external lateral ligament
(2) Subluxation of talus

Clinic: (*a*) Local signs
(*b*) Excessive internal displacement of talus on inversion
(*c*) X-Ray: With foot in inversion
: Tilting of talus

Treat: **Fixation:**
In: Optimum position
By: Plaster-of-Paris
Extent: Below the knee to metatarsal heads
For: 10 weeks

Compl: (1) **Compound dislocation:**
Treat: Debridement + Winnet orr

(2) **Recurrent dislocation:**
Clinic: (1) Frequent 'giving way' with insecurity of the joint
(2) Medial displacement of talus on inversion of the foot
(3) X-Ray in inversion
Treat: (*a*) Apparatus:
: Inside iron + outside T strapp
(*b*) *Operative reconstruction:*
: Tenodesis by peroneus brevis tendon from external malleolus to talus neck

After-treat: Fixation:
In: Optimum position
By: Plaster-of-Paris
For: 8 weeks

(3) **Fracture-dislocation:** (See under fractures)

(B) **Abduction–eversion strains:** ***With internal ligament injuries***

(1) **Sprain of internal ligament:**

Clinic: Local tenderness

Treat: (1) Elastoplast
(2) Leriche novocain injection

(2) **Avulsion or rupture of internal ligament:**

Clinic: (1) Local signs
(2) *Lateral displacement of talus on eversion*
(3) X-Ray: in eversion: tilting of talus

Treat: (1) Accurate reduction
↓ (2) Fixation:
In: Optimum position
By: Plaster-of-Paris
Extent: Below the knee to metatarsal heads
For: 8 weeks

(C) Dislocation of the astragulus:

Etio: (1) Aeroplane accidents
(2) Inversion and eversion strains on ankle

Path: (A) Dorsal or forwards: (*a*) Subluxation
(*b*) Dislocation
(B) Backwards: rare
(C) Lateral: inwards or outwards
: (In association with lateral ligament injuries)

Clinic: (1) Forwards: malleoli nearer the sole
(2) Posterior: tendo achillis hollows filled up

Treat: (*a*) Manipulative reduction:
: Flexion of the knee
↓ Manipulations
↓ Plaster fixation
(*b*) Astragalectomy

(B) ARTHRITIS:

Path. position: Extension and inversion

Swelling: (*a*) Dorsum
(*b*) Either side of tendo achillis

Therapeutic posture: (*a*) Right angles
(*b*) Slight inversion

(1) GONOCOCCAL ARTHRITIS OF THE ANKLE: (See under general joints)

(2) TUBERCULOSIS OF THE ANKLE:

Etio: **Neglected chronic strains and sprains**

Origin: (*a*) Synovial
(*b*) Osseous: astragular neck

Clinic: (1) Painful limp
(2) Pulpy swelling: dorsal → posterior → lateral
(3) Restricted movements
(4) Muscular wasting
(5) Cold abscesses and sinuses

Diff. diag: (1) T. B. tarsus
(2) T. B. tendons

↓ (2) Walking plaster:
In: Right angled dorsiflexion + neutral position
For: 6 weeks

↓ (3) *Viscopaste or* **elastoplast** *strapping*

(3) Midtarsal dislocation:

Path: Through (1) Astragulo-scaphoid
+ (2) Calcaneo-cuboid

Clinic: Deformity of the foot

Treat: (1) Manipulative reduction
↓ (2) Walking plaster:
In. Optimum position
For: 6 weeks

(B) ARTHRITIS: *Special causes:*

(1) Secondary syphilitic midtarsal arthritis:
: Monarticular plastic arthritis and periarthritis

(2) Tuberculous arthritis of tarsal joints:

Etio: **Neglected sprains**

Path: Origin: osseous: (*a*) Os calcis
(*b*) Astragulus
(*c*) Cuboid

Clinic: (1) Painful limp
(2) Restricted eversion and inversion
(3) Shiny tender œdematous swelling
(4) Cold abscesses and sinuses

Compl: Secondary pyococcal infection

Treat: (1) Plaster-of-Paris immobilisation
(2) Scraping
(3) Excision of bones
(4) Amputation: at the site of election

(3) Osteoarthritis:
: Metatarso-phalangeal joint of great toe

(4) Gout: ***Metatarso-phalangeal joint of great toe***

(C) OPERATIONS ON FOOT JOINTS:

Arthrodesis:

Ind: (1) **Infantile paralysis:**
(*a*) Two years after the onset
(*b*) Residual after physiotherapy
(*c*) Age more than 10
+ (2) **Persistent deformity** with majority of muscles paralysed

(A) Midtarsal arthrodesis:

Tech: (1) Incision: inner side of the dorsum from astragulus to scaphoid
(2) Displacement of soft tissues

(3) Removal of cartilage from:
(a) Head of astragulus
(b) Scaphoid
(c) Cuboid } if required
(d) Os calcis }
(4) Closure

After-treat: Fixation:
In: (a) Heel and heads of 1st and 5th metatarsal in one plane
(b) Ankle at right angles
By: Plaster-of-Paris
For: 3 months

(B) Posterior subastragaloid arthrodesis:
Tech: (1) Incision: along the inner side of tendo achillis
(2) Displacement of soft tissues
(3) Removal of cartilage from:
(a) Astragulus
(b) Os calcis
(4) Closure

After-treat: As in (A)

(C) Dunn's triple arthrodesis:
Tech: (1) Incision:
(a) External:
: 2" above the ankle to the base of 5th metatarsal
or (b) Dorsal skin flap
(2) Retraction of soft tissues
(3) Exposure of joints:
(a) Subastragaloid
(b) Calcaneo-cuboid
(c) Astragulo-scaphoid
(4) Removal of:
(a) Scaphoid
(b) Cartilage from:
(1) Head of astragulus
(2) Post. surfaces of cuneiforms
(3) *Calcaneo-cuboid joint*
(4) Posterior subastragaloid joint
(5) Closure

After-treat: Fixation:
In: Corrected position: (See A)
By: Plaster-of-Paris
For: 3 months

IMPORTANT POINTS

(1) Most common sequela of joint trauma:
: Traumatic adhesions

(2) Most common sequela of neglected sprain:
: Tuberculosis of the joint

(3) Sprain requires no more than regular muscle exercises :
: Ruptures and avulsions necessitate plaster immobilisation

(4) Muscles are first line of defence of a joint; ligaments are second.

(5) Stiffer the joint, less valuable is the manipulative treatment. More mobile the joint, more valuable is the manipulative treatment.

(6) Manipulative treatment is most successful in:
(a) Tennis elbow
(b) Strains of knee
(c) Strains of ankle

(7) Bony ankylosis is the rule in suppurative arthritis and T. B. spine. Fibrous ankylosis or resolution is the rule in non-suppurative arthritis.

(8) No operations on joints should be undertaken without:
(a) X-Ray films
(b) Preoperative plaster, splint or extension preparations
(c) Surety of asepsis

(9) No-touch technique is the best in bone and joint surgery

(10) Incisions for exposure of a joint:
(a) Adequate exposure
(b) Avoidance of nerves, vessels and tendons
(c) Over the intermuscular spaces
(d) Capsulotomy in the long axis of the limb

(11) *Stiff joints are more frequent after the use of the drainage* tubes. No drainage tube should enter the joint cavity. Drainage tube or rubber dam should be introduced upto but not through the synovium.

(12) Some form of arthrodesis is advocated in all cases of joint tubercle, when they are quiescent, provided no sinuses exist.

(13) Extra-articular arthrodesis has been accepted as the necessary [illegible] for all cases of joint tuberculosis which are slow in [illegible] [illegible]d of one year's conser- [illegible]

(14) In all cases of apparently incurable poly-articular ankylosis of unknown origin, if there is hypercalcæmia, parathyroidectomy is worth considering.

(15) Arthrodesis is better in:
(a) Active and persistent chronic affections: T. B.
(b) Laborious occupations
(c) *Lower extremity*

(16) Arthroplasty is better in:
(a) Traumatic cases
(b) Skilful occupations
(c) Upper extremity

(17) Arthroplasty is seldom indicated in tuberculosis

(18) Joints for arthroplasty:
- (a) Elbow
- (b) Hip
- (c) Jaw
- (d) Knee

(19) Joints for arthrodesis:
- (a) Knee
- (b) Shoulder
- (c) Wrist
- (d) Ankle

(20) Patients in acute joint condition:
: Do the minimum most delicately:
- (a) Aspiration or small arthrotomy
- (b) Gradual atraumatic weight extension:
  - (α) Gradual change from pathological into physiological position
  - (β) Relief of muscle spasm
  - (γ) No bone friction

(21) During infancy, pneumococcus is the commonest cause of acute arthritis.

(22) Painful osteoarthritis: metabolic, toxic or mechanical
Painless osteoarthritis · Charcot

(23) Pyococcal, gonorrheal and osteoarthritic are the most common forms of arthritis of temporo-mandibular joint.

(24) Internal derangement due to abnormal menisci:
- (a) Temporo-mandibular: snapping jaw
- (b) Knee: medial or lateral meniscus

(25) Intra-articular ankylosis of temporo-mandibular joint requires excision and arthroplasty. Extra-articular ankylosis requires Esmarch's operation.

(26) In acromio-clavicular dislocation, strapping should go over the clavicle and supra-clavicular triangle and not over the shoulder.

(27) Arthrodesis of acromio-clavicular joint leads to limitations of abduction of shoulder and scapular movements.

(28) Every patient with shoulder dislocation must be examined for nerve lesions. Most common nerve involved is the axillary with deltoid paralysis.

(29) Passive stretching in the after-treatment of dislocation shoulder leads to: (a) Permanent stiffness
(b) Myositis ossificans

(30) Abduction frame in shoulder injuries:
  (a) Adduction fractures: anatomical neck of the humerus
  (b) Abduction unimpacted fracture:
    : Surgical neck of the humerus
    : Only along with traction
  (c) Dislocation shoulder with:
    (a) Fracture greater tuberosity
    (b) Avulsion of supraspinatous
  (d) Fracture-dislocation of greater tuberosity.

(31) Until eversion is regained, full abduction cannot be regained in the shoulder joint.

(32) Many shoulders stiff after trauma, are made stiffer by manipulations given too soon, too often and too much.

(33) Operations for recurrent dislocations of shoulder:
  (1) Clairmont: Deltoid sling: extra-articular
  (2) Bankart: Repair of anterior part of glenoid ligament: . Articular
  (3) Oudard: Turning coracoid piece down after plication: : Articular + extra-articular
  (4) Henderson: Fascial sling through head : *Intra-articular*
  (5) Nicola: Long biceps tendon through head . Intra-articular
  (6) Hey Groves: Fascial sling: extra-articular.

(34) A great number of disabled shoulder joints are in reality due to rupture of supraspinatous tendon; and any case of shoulder injury with loss of abduction should be operated upon to explore the condition of supraspinatous tendon.
  Tech: (1) Vertical slit of the deltoid
  (2) Open the subacromial bursa
  (3) Silk suture of the tendon
  After-treat: Abduction fixation

(35) Forward dislocation of the elbow is the only dislocation to be treated in extension.

(36) Painful inability to supinate and extend in children with history of any pull on the elbow:
  Diag: Nipped synovial membrane
  Treat: Flex → extend → supinate.

(37) Ir [illegible] ... ...minated fracture of the lower [illegible]

[illegible] ten days of the injury.

(38) A patient with an elbow soundly ankylosed in good position will seldom require an arthroplasty.

(39) The diagnosis of simple sprain of the wrist must be accepted with considerable caution, unless repeated radiograms in all possible directions exclude bone injury.

(40) Widely displaced semilunar should be excised as early as possible.

(41) Arthrodesis is far better than arthroplasty in wrist.

(42) Differential diagnosis of chronic wrist conditions:
  (1) Chronic sprain of the wrist
  (2) Fracture navicular
  (3) Post-traumatic semilunar dystrophy . Kienboch
  (4) Chronic osteoarthritis
  (5) Tuberculosis.

(43) In arthroplasty of metacarpo-phalangeal joints: preserve metacarpal heads; excise phalanx bases; pin extension through the pulp in the after-treatment

(44) Causes of unequal legs ·
  (1) Malunion of fractures
  (2) Faulty ankylosis of the hip
  (3) Poliomyelitis
  (4) Congenital dislocation of the hip.

(45) In cases of low backache, determine whether it is due to arthritis of:
  (*a*) Sacroiliac joint: do arthrodesis
  (*b*) Lumbar spine: do fusion
  (*c*) Both: do arthrodesis + fusion.

(46) Early sacroiliac tuberculosis: conservative treatment
↓ extra-articular arthrodesis.

(47) *Extra-articular arthrodesis is better than intra-articular* method in sacroiliac joint.

(48) The most frequent complication of dislocation of the hip joint is avascular necrosis of the head of the femur.

(49) If in post-reduction radiograph, lesser trochanter is not seen, dislocation of the hip is not reduced. Confirm by taking a lateral radiograph.

(50) There are five phases of congenital dislocation of the hip:
  (1) Predislocation stage: Braur's test: infants
  (2) Reduction stage: 1 to 3 years
  (3) Open operation stage: 3–6 years
  (4) Reconstructive stage: 6 years to adolesc
  (5) Palliative stage: adults.

(51) In old cases of congenital dislocation of the hip, the femoral head is displaced in three directions :
(1) Upward : shortening
(2) Backward : lordosis
(3) Outward : rolling gait.

(52) After reduction of congenital dislocation of the hip, the femoral head should lie vertically below the sacroiliac joint.

(53) A persistent hip lesion in a child under five is likely to be tuberculous ; between five and ten, pseudo-coxalgia is more common ; in the second decade, traumatic coxa vara is the characteristic affection, tuberculosis being comparatively rare.

(54) Coxitis in children :
(1) Congenital dislocation : infancy
(2) Tuberculosis : 1 to 5 years
(3) *Pseudo-coxalgia : 5 to 10 years*
(4) Traumatic coxa vara : 10 to 20 years
(5) Infective arthritis

(55) Complete disappearance of spasm after 4–8 weeks of treatment together with persistently negative X-Rays, is very suggestive of non-tuberculous lesion.

(56) Recurrence of symptoms when patient is allowed to get up points strongly to tuberculous hip.

(57) Extra-articular arthrodesis is a good step in early stages of tuberculosis of the hip either as soon as the disease is diagnosed or at the termination of conservative treatment.

(58) Limitation of all movements, especially of extension (psoas-spasm) is the earliest sign of T. B. hip.

(59) If the limb can be placed across the middle third of the opposite thigh, it is not T. B. hip.

(60) Ability to sit in tailor's position excludes T. B. hip.

(61) In subtrochanteric osteotomy for ankylosis of hip, the angle of corrective abduction should not be more than 25°. Success of Lorenz's bifurcation osteotomy depends upon the fixation of limb in correct abduction.

(62) After any operation on the hip joint, majority of patients are more comfortable if they wear a caliper for some months after operation.

(63) Worst treatment of sprained knee is :
(a) Immobilisation in splint or plaster
(b) *Neglect of muscle exercise*
(c) Knee cage

(64) Importance of active non-weight-bearing exercises of quadriceps extensor for five minutes hourly throughout the day, cannot be overemphasised in injuries of the knee joint which require immobilisation.

(65) In young patients most common knee joint injuries are :
(a) Tears of internal lateral ligament
(b) Tears of internal semilunar cartilage

(66) In middle-aged and elderly people, most common knee joint affections are :
(a) Injury to perisynovial fat
(b) Rupture of adhesions

(67) Complete tear of the internal lateral ligament is indicated by abduction of the leg on the femur for 30° or more.

(68) Locking : limitation of flexion and extension due to mechanical obstruction.

(69) If one finds :
(a) Small joint effusion
(b) Tenderness at the typical place
(c) Wasting of vastus internus
(d) Typical history
It is a case of torn semilunar cartilage if X-Ray excludes other conditions.

(70) If there is a persistent click within the last 10° of full extension, it is conclusive of external cartilage tear.

(71) Loose bodies in knee joint :
Young age : (a) Detached semilunar cartilage
(b) Detached articular cartilage
Old age : Detached osteophytes

(72) In the first half of life, loose bodies should always be removed from the knee joint if they give rise to symptoms.

(73) In torn or loose semilunar cartilage, it is better to excise the whole cartilage than only the injured portion.

(74) When the knee joint has suffered severe injury, X-Ray may show a normal appearance although the main ligaments are torn.

(75) In doubtful cases, examine the knee joint under anæsthesia and forcible movements in all directions should be tested.

(76) Early treatment for cruciate ligament ruptures is plaster immobilisation for three months. If there is instability of joint as a sequela, Hey Grove's fascia lata method may be employed.

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(b) Detached articular cartilage
Old age: Detached osteophytes

(72) In the first half of life, loose bodies should always be removed from the knee joint if they give rise to symptoms.

(73) In torn or loose semilunar cartilage, it is better to excise the whole cartilage than only the injured portion.

(74) When the knee joint has suffered severe injury, X-Ray may show a normal appearance although the main ligaments are torn.

(75) In doubtful cases, examine the knee joint under anæsthesia and forcible movements in all directions should be tested.

(76) Early treatment for cruciate ligament ruptures is plaster immobilisation for three months. If there is instability of joint as a sequela, Hey Grove's fascia lata method may be employed.

(77) Primary osseous T.B. of the knee is *more amenable to treatment* than primary synovial tuberculosis.

(78) Routine treatment of T.B. knee:
- (a) Below 9 years: conservative only
- (b) Adults: excision → arthrodesis
- (c) Primary osseous lesion: extra-articular erasion
  or: excision.

(79) In T.B. *knee, synovial disease and childhood are indications* for conservative treatment, whereas bony lesions in adults require excision with arthrodesis

(80) In exposure of knee joint, Timbrel Fisher's interno-lateral exposure is better than Robert Jone's split patella method.

(81) Stiff painless knee in good position performs excellent function.

(82) Knee cage hinders the recovery of knee joint lesions by coming in the way of muscle exercises.

(83) In all fracture-dislocations of the ankle, immobilisation is necessary for at least ten weeks, after which zinc-gelatin dressings for six weeks with active exercises of ankle and tarsal joints are enjoined, walking being allowed with plaster boot after three weeks.

(84) *Osteoarthritis is the most common sequela of injuries of* ankle joint.

(85) Summary of joint affections:
- (1) Congenital dislocations:
  : Hip
- (2) Trauma:
  - (A) Sprain: ankle, knee, wrist, shoulder, elbow
  - (B) Dislocations and subluxations:
    : Shoulder, hip
  - (C) Fracture-dislocations:
    : *Ankle, shoulder, elbow, hip*
  - (D) Internal derangements:
    : Knee; temporo-mandibular
  - (E) Penetrating wounds
- (3) Inflammations:
  - (A) Traumatic arthritis: *sprains*
  - (B) Infective arthritis:
    - (a) Pyogenic: (α) Pyococcal
      (β) Pyæmic
    - (b) Pneumococcal: one large joint
    - (c) Typhoid: hip

(C) Specific:
- (*a*) Gonorrheal: knee, ankle, digits, temporo-mandibular
- (*b*) Syphilitic: knee
- (*c*) Tuberculous: knee, hip, ankle, tarsal, shoulder, elbow, wrist, carpal

(D) Toxic, metabolic or mechanical arthritis:
- (*a*) Focal secondary: any
- (*b*) Rheumatoid: proximal inter-phalangeal metacarpo-phalangeal
- (*c*) Osteoarthritis:
  - knee, hip, shoulder
  - metacarpo-phalangeal of thumb
  - metatarso-phalangeal of great toe
  - temporo-mandibular
- (*d*) Rheumatic: any joint, multiple
- (*e*) Gouty: metacarpo-phalangeal of thumb

(E) Neurotrophic arthritis.
- (*a*) Hysterical
- (*b*) Charcot. knee, shoulder
- (*c*) Trophic

(F) Miscellaneous arthritis:
- (*a*) Non-gonorrheal urethritic
- (*b*) Dysenteric
- (*c*) Zymotic

(4) Abnormal contents:
- (A) Hydrarthrosis: knee, shoulder
- (B) Hæmarthrosis: knee
- (C) Pyarthrosis
- (D) Loose bodies: knee

(5) Ankylosis:
- (A) False
- (B) True: (*a*) Fibrous
  - (*b*) Bony

(86) Multiple arthritis:
- (1) Pyæmic
- (2) Gonorrheal
- (3) Syphilitic: symmetrical
- (4) Rheumatoid
- (5) Osteoarthritis: senile
- (6) Rheumatic
- (7) Dysenteric

(87) Painful arthritis:
- (1) Pyococcal
- (2) Tuberculous
- (3) Gonorrheal

(4) Rheumatoid
(5) Rheumatic and gouty
(6) Osteoarthritis

(88) Relatively painless arthritis :

(1) Pyæmic
(2) Syphilitic
(3) Neuropathic.

CHAPTER IX

WATSON JONE'S CLASSIFICATION OF INJURIES

(I) INJURIES OF THE SPINE:

(1) **Fractures of transverse processes**

(2) **Fractures of spinous processes**

(3) **Fractures of dorso-lumbar vertebræ:**

(A) Flexion fractures:

(1) Compression fracture

(2) Comminuted fracture

(3) Fracture-dislocation

(B) Extension fractures

(4) **Fracture-dislocations of cervical spine:**

(A) Crush fracture

(B) Sprain of cervical joint

(C) Subluxation of cervical joint

(D) Dislocation of cervical joint

(5) **Fracture-dislocations of atlas:**

(A) Fracture

(B) Hyperextension fracture-dislocation

(C) Forward dislocation:

(1) Without fracture odontoid

(2) With fracture odontoid

(D) Spontaneous dislocation

(6) **Vertebral fracture-dislocation with paraplegia**

(7) **Sciatic scoliosis syndrome:**

(A) Myofascial and ligamentous injuries:

(1) Sacrospinalis and gluteus

(2) Fascial contractures and adhesions

(3) Inter-articular ligamentous strain:

(a) Sacroiliac

(b) Lumbo-sacral

(B) Joint injuries and arthritis:

(1) Sacroiliac

(2) Spondylitis deformans

(3) Osteoarthritis lumbar spine

(4) Lumbo-sacral

(5) Inter-articular

(8) **Intervertebral disc injuries :**

(A) Retropulsion of the disc
(B) Fibrosis of ligamentum flava

(II) INJURIES OF THE PELVIS:

(1) **Avulsion fractures of the pelvis :**

(A) Anterior superior iliac spine : sartorius
(B) Anterior inferior iliac spine : rectus femoris
(C) Ischial epiphysis : hamstring

(2) **Isolated injuries of the pelvic ring :**

(A) Fractures of pubic rami
(B) Sacroiliac subluxation

(3) **Combined injuries of the pelvic ring :**

(A) Pubic segments :
(1) One side
(2) Both sides

(B) Iliac and pubic segments :
(1) Dislocation
(2) Fracture-dislocation

(4) **Injuries of sacrum and coccyx :**

(A) Fracture sacrum
(B) Fracture coccyx

(III) INJURIES OF THE CHEST :

(1) **Fracture ribs**
(2) **Fracture sternum**
(3) **Fracture thyroid cartilage**

(IV) INJURIES OF THE FACE AND JAW :

(1) **Fracture nasal bones :**

(A) Lateral impaction
(B) Vertical impaction

(2) **Fracture malar bone**

(3) **Injury to mandible :**

(A) Simple fracture
(B) Simple dislocation :
(1) Unilateral
(2) Bilateral
(3) Central

(C) Fracture dislocation

(V) INJURIES OF THE SHOULDER :

(1) **Capsule and tendon injuries :**

(A) **Supra-spinatous tendinitis :**
(1) Simple strain

(2) Calcification
(3) Rupture:
(a) Complete
(b) Incomplete
(B) **Rupture biceps tendon**
(C) **Periarthritis and adhesions** shoulder
(2) **Bone and joint injuries:**
(A) **Fracture clavicle**
(B) **Dislocation sterno-clavicular joint**
(C) **Dislocation acromio-clavicular joint:**
(1) Subluxation
(2) Dislocation
(D) **Fracture scapula:**
(1) Body
(2) Neck
(3) Coracoid
(E) **Fracture humerus:**
(1) Great tuberosity
(2) Neck:
(a) Crack fracture
(b) Adduction fracture
(c) Abduction fracture
(d) Impacted fracture-dislocation
(F) **Dislocation shoulder:**
(1) Simple
(2) With fracture of great tuberosity
(3) With avulsion of supraspinatous
(4) Recurrent
(5) Fracture-dislocation

(VI) INJURIES OF THE ARM:
Fractures shaft of the humerus

(VII) INJURIES OF THE ELBOW:
(1) **Traumatic synovitis elbow**
(2) **Tennis elbow**
(3) **Fracture head of the radius:**
(A) Crack fracture
(B) Marginal fracture with displacement
(C) Comminuted fracture
(4) **Fracture capitellum:**
(A) Bruising of articular cartilage
(B) Chip fracture
(C) Half fracture
(5) **Fracture olecranon**

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(2) Dislocation

(D) **Fracture scapula:**
(1) Body
(2) Neck
(3) Coracoid

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(2) Dislocation
(D) **Fracture scapula:**
(1) Body
(2) Neck
(3) Coracoid
(E) **Fracture humerus:**
(1) Great tuberosity
(2) Neck.
(a) Crack fracture
(b) Adduction fracture
(c) Abduction fracture
(d) *Impacted fracture-dislocation*
(F) **Dislocation shoulder:**
(1) Simple
(2) With fracture of great tuberosity
(3) With avulsion of supraspinatous
(4) Recurrent
(5) Fracture-dislocation

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(A) *Bruising of articular cartilage*
(B) Chip fracture
(C) Half fracture
(5) **Fracture olecranon**

(6) **Supra-condylar fracture humerus:**
- (A) Supra-condylar
- (B) Trans-condylar
- (C) Inter-condylar T and Y

(7) **Epiphysial injuries at the elbow:**
- (A) Forward dislocation of lower humeral epiphysis
- (B) Dislocation external condyle epiphysis
- (C) Dislocation internal condyle epiphysis
- (D) Dislocation upper radial epiphysis

(8) **Dislocation of elbow joint**

(9) **Dislocation of radial head**

(10) **Fracture-dislocation of the elbow:**
- (A) Fracture coronoid
- (B) Fracture olecranon
- (C) Fracture radial head
- (D) Avulsion of internal epicondyle
- (E) Fracture condyle

(VIII) INJURIES OF THE FOREARM:

(1) **Fracture of the shafts of both the bones:**
- (A) Greenstick and crack
- (B) Complete

(2) **Fracture ulnar shaft + dislocation radial head**

(3) **Fracture radial shaft + dislocation inferior radio-ulnar joint**

(IX) INJURIES OF THE WRIST:

(1) **Sprain of the wrist:**
- (A) Traumatic tenosynovitis
- (B) Tendo-vaginitis stenosans
- (C) Peritendinous fibrosis

(2) **Fracture lower end of the radius:**
- (A) Colles' fracture
- (B) Radial styloid fracture:
  - (1) Compression
  - (2) Avulsion
- (C) Posterior marginal fracture
- (D) Anterior marginal with subluxation of the wrist

(3) **Ruptures of tendons:**
- (A) Extensor pollicis longus
- (B) Flexor pollicis longus

(4) **Displacement of lower radial epiphysis:**
- (A) Backwards
- (B) Crushing

(5) **Fracture of the scaphoid :**
- (A) Tubercle
- (B) Waist
- (C) Proximal pole

(6) **Dislocation of carpal bones :**
- (A) Semilunar
- (B) Scaphoid
- (C) Perilunar
- (D) Fracture-dislocation of carpus

(X) INJURIES OF FINGERS AND HAND:

(1) **Fracture metacarpals :**
- (A) Fractures at the **base** of the thumb :
  - (1) Base of the metacarpal
  - (2) Bennett's fracture-dislocation
- (B) Fractures of the **shafts** of metacarpals :
  - (1) Spiral
  - (2) Transverse
- (C) Fractures **neck** of metacarpals

(2) **Dislocation of carpo-metacarpal joints**

(3) **Metacarpo-phalangeal-sprains and dislocations :**
- (A) Thumb :
  - (1) Sprain of the thumb
  - (2) Subluxation of the thumb
  - (3) Dislocation of first metacarpo-phalangeal
- (B) *Other metacarpo-phalangeal joints*

(4) **Fractures proximal phalanges**

(5) **Inter-phalangeal :**
- (A) Sprains
- (B) Subluxations
- (C) Dislocations
- (D) Fractures
- (E) Fracture-dislocations

(6) **Mallet finger :**
: Avulsion of extensor tendon insertion

(7) **Trigger finger :**
: Avulsion of middle slip of extensor tendon

(XI) INJURIES OF THE HIP:

(1) **Avulsion of epiphysis near hip joint:**
- (A) Avulsion of lesser trochanter
- (B) Avulsion of greater troc[illegible]
- (C) Avulsion of iliac [illegible]

(2) **Displacement of upper femoral epiphysis:**
: Adolescent epiphysial coxa vara

(3) **Traumatic dislocation of the hip:**
(A) Simple
(B) Fracture-dislocations:
(1) Femoral head
(2) Femoral neck
(3) Femoral shaft: upper half
(4) Acetabulum

(4) **Fracture neck of the femur:**
(A) Abduction fractures:
: Impacted subcapital
(B) Adduction fractures:
(1) Subcapital and trans-cervical
(2) Inter-trochanteric
(3) Per-trochanteric

(XII) INJURIES OF THE THIGH:
(1) **Sub-trochanteric fracture of the femur**
(2) **Fracture shaft of the femur**
(3) **Supra-condylar fracture femur**
(4) **Displacement of lower femoral epiphysis**

(XIII) INJURIES OF THE KNEE:
(1) **Internal derangements of the knee:**
(A) Traumatic synovitis and hæmarthrosis
(B) Injuries to the ligaments:
{ (1) Sprains
(2) Ruptures
(3) Avulsions
Of: { (*a*) Internal lateral lig
(*b*) External lateral lig.
(*c*) Cruciate lig.: anterior & posterior
(C) Dislocation of the knee
(D) Fracture tibial spine
(E) Injuries to *semilunar cartilage:*
(1) Bucket-handle
(2) Posterior horn
(F) Loose bodies

(2) **Injuries of the extensor mechanism of the knee:**
(A) Avulsion of the quadriceps
(B) Rupture quadriceps with fracture patella
(C) Avulsion of lig. patella from patella
(D) Fracture tibial tubercle or separation of tubercle-epiphysis

(3) Injuries of the patella:

(A) Fracture:

(1) Direct: (*a*) marginal

(*b*) chip

(2) Indirect

(B) Dislocation

(4) Fracture external tuberosity of the tibia:

(A) Depressed

(B) Comminuted

(XIV) INJURIES OF THE LEG:

(1) Fractures shaft of the leg bones:

(A) Without overriding

(B) With overriding

(C) Compound

(D) Infected

(E) Ununited

(F) Synostosed

(XV) INJURIES OF THE ANKLE:

(1) Sprain of the ankle

(2) Subluxation or dislocation of the ankle

(3) Dislocation of peroneal tendons

(4) Sprain and rupture of internal lateral ligament

(5) Fractures and fracture-dislocations:

(A) **Abduction-external rotation:** Pott or Depuytren

(1) Fracture external malleolus

(2) Fracture external malleolus

\+ Avulsion internal ligament or malleolus

\+ Outward dislocation of astragulus

(3) Fracture external malleolus

\+ Avulsion internal ligament or malleolus

\+ Posterior marginal fracture tibia

\+ Dislocation astragulus:

(*a*) Outward

\+ (*b*) Backward

(B) **Adduction:**

(1) Fracture internal malleolus

(2) Fracture internal malleolus

\+ Avulsion external ligament or malleolus

\+ Inward dislocation of astragulus

(3) Fracture internal malleolus

\+ Avulsion external ligament or malleolus

\+ Posterior marginal fracture tibia

\+ Dislocation astragulus:

(*a*) Inward

\+ (*b*) Backward

(C) **Vertical compression :**

: Anterior marginal fracture tibia
\+ Forward dislocation astragulus
\+ Comminution tibia and malleoli

(D) **Compound injuries**

(6) **Epiphysial injuries :**

(A) Abduction + external rotation : tibial epiphysis
(B) Adduction

(XVI) INJURIES OF THE FOOT :

(1) **Adhesions of the foot :**

(A) After fractures or dislocations of the foot
(B) After fractures of the leg
(C) After arthrodesis
(D) After flat foot

(2) **Fracture os calcis :**

(A) Isolated and uncomplicated :

(1) Vertical fracture of tuberosity
(2) Horizontal fracture of tuberosity
(3) Sustentaculum tali

(B) Comminuted fracture with minimal joint injury :

(1) Fissure fractures
(2) Fracture outer wall and body

(C) Comminuted fracture with severe joint injury :

(1) Fracture outer wall and body
\+ (2) Crushing of :

(*a*) Outer part of post-articular surface
(*b*) Whole posterior articular surface
(*c*) Anterior articular surface

(3) **Fractures and dislocations of astragulus :**

(A) Fracture trigonal process
(B) Avulsion capsule from the astragular neck
(C) Dislocation astragulus
(D) Fracture neck of the astragulus

(4) **Subastragaloid midtarsal dislocations and fracture-dislocations :**

(A) Subastragaloid fracture-dislocation
(B) Subastragaloid midtarsal dislocation
(C) Midtarsal dislocation

(5) **Fracture tarsal scaphoid :**

(A) Kohler's disease
(B) Tuberosity
(C) Crush fractures
(D) Fracture-dislocations

(6) **Fracture metatarsals :**
- (A) Avulsion fracture base of the 5th
- (B) March fractures
- (C) Fractures neck of the metatarsals

(7) **Fracture of the toes :**
- (A) Proximal phalanges
- (B) Comminuted
- (C) Open

AMPUTATIONS AND DISARTICULATIONS :

Amputation : Removal of a limb by division of bone

Disarticulation: Removal of a limb by division through a joint

Objects : (1) **Removal of a pathological condition**

(2) **Good functioning stump :**
- (A) Suitable length
- (B) Good scar : non-adherent, non-irritable
- (C) Good muscles
- (D) Good bone : non-adherent, well covered
- (E) Good joint : painless and full movements
- (F) Good nerves : non-adherent, no neuritis
- (G) Good circulation

(3) **Easy wear of artificial limb :**
- (A) **Weight bearing :** Lower limb
  - (1) End bearing : Symes, Stokes-Gritti
  - (2) Proximal and lateral bearing :
    - : (a) Midleg
    - (b) Supra-condylar
- (B) **Transmitting :** Upper limb

Indications :

(1) Primary immediate amputation

(2) Preliminary treatment + conservative operations
↓ Secondary amputation lower down

(3) Expectant and conservative treatment
↓ Secondary unavoidable amputation

Varieties :

(1) **Amputation of election :**
: Classical amputation

(2) **Urgent or guillotine :**

Ind : Urgent general condition

Tech : Division of skin, muscles and bone at one level

After-treat : Re-amputation higher up

(3) Flapless amputation :

Ind : (1) Urgent general condition
(2) Urgent local condition :
(a) Bad trauma
(b) Infections
(c) Gangrene

Tech : (a) Amputate at lowest level
(b) Avoid straight section
(c) Save as much skin as possible if at critical level
(d) Division : skin → soft tiss. → bone : At the level of retraction of the predecessor

After-treat : (a) Flap extension by traction :
(α) Suture traction
(β) Adhesive traction
(b) Re-amputation : if required

(4) Open flap amputation :

Ind : (1) Trauma
(2) Infections : (a) Pyogenic
(b) Anærobic

Tech : (a) Stitch the flaps back
(b) Magsulph glycerine dressings
(c) Secondary sutures of flaps

(5) Sleeve amputation :

Ind : Compound fracture near the lower end of a long bone with peripheral gangrene

Tech : (a) Amputation by guillotine method at the lower end of the bone
(b) Dissection and excision of the lower fractured fragment
(c) Leave the soft tissue sleeve open

(6) Kineplastic amputation :

Def : Amputation designed to have direct control over mechanical contrivances without the use of an artificial limb

Tech : Preservation of antagonistic action by suturing muscles together at the end of the stump

Methods : (a) Club motor :
: Bulbous projecting knob of muscles or tendons at the junction of opposing muscle groups and covered with skin to which cords of prosthesis are attached by a ring.
The movements of the club give movements of the artificial limb.

(b) Loop motor:
: Loop of tendons formed from the opposing muscles with opening at the centre.

(c) Tunnel motor:
(A) Tendon tunnel:
(B) Muscle tunnel:
: Pedicled skin tunnel flap which passes under the tendon or muscle and through which a metal rod is passed.

(d) Pseudarthrosis motor:
: Separation and mobilisation of terminal portion of the bone to which opposing muscles are attached and formation of pseudarthrosis.

Stages of treatment :

(1) **Preoperative:**
- (a) **Specific:**
  - (α) Insulin in diabetes
  - (β) Sera in gas gangrene
- (b) **Supportive:**
  - (α) Blood transfusion
  - (β) Glucose saline
- (c) **Preventive:** Anti-coagulants
- (d) **Conservative:**
  - (α) Main vein ligature
  - (β) Periarterial sympathectomy
  - (γ) Embolectomy

(2) **Operation:**
- (a) Determination of level
- (b) Determination of type of flaps
- (c) Closed or open

(3) **Surgical after-treatment:**
- (a) Prevention or treatment of infection
- (b) Prevention of soft tissue retraction

(4) **Treatment of the stump:**
- (a) Treatment of sinuses and ulcers
- (b) Restoration of joint function
- (c) Restoration of muscle function
- (d) Restoration of normal circulation

Tech: (1) Massage, active exercises, physiotherapy
(2) Temporary appliances

(5) **Permanent prosthesis:**
Ind: (a) Disappearance of stump sense
(b) Attainment of maximum shrinkage

(c) Satisfactory mobility
(d) Complete wound healing

(6) **Functional and vocational re-education :**
: Development of remaining limb

Technique :

(1) *Hæmostatic control :*

Methods :

(A) **Tourniquet :**

Contraind : (a) **Vascular diseases**
(b) Root disarticulations

Tech : (a) Application after emptying of the limb, unless for sepsis
(b) Application over a towel

Removal : (A) Early :
(α) Ligature of main vessels
↓ (β) Removal of tourniquet
↓ (γ) Deliberate branch ligatures
↓ (δ) Closure of the wound

(B) Late :
(α) Closure of the wound
↓ (β) Pressure bandage
↓ (γ) Removal of tourniquet

(B) **Pressure on main artery :**

Ind : (1) Vascular diseases
(2) Root disarticulations

Tech : (a) Digital pressure
(b) Temporary clamps

(C) **Preliminary first-step ligature of main vessels**

(2) *Determination of level :*

(A) Get clear of the pathology

(B) Levels : as regards prosthesis :

(1) **Upper extremity :**

(a) **Digits :**
Thumb : save at all costs
One finger : whole can be sacrificed
Multiple fingers : save proximal digits

(b) **Hand ; Metacarpal region : good level**

(c) **Wrist : Bad level**
(α) Stump too long
(β) No pronation and supination

(*d*) **Forearm :**

(α) **Optimum :**

(i) Junction of lower and mid. third

(ii) **8 in. from the olecranon tip**

(β) **Critical :**

: 5 inches from the olecranon tip

(*e*) **Elbow : Bad level**

: Bulbous, tender, irregular stump

(*f*) **Arm :**

(α) **Optimum :**

(i) Supra-condylar

(ii) **8 in. from the axillary fold**

(β) **Critical :**

: 4 inches from the axillary fold

(*g*) **Shoulder :**

(α) If appliance is not to be worn :

: Leave the humeral head in

(β) If appliance is to be worn :

: Excise the humeral head

(2) **Lower extremity :**

(*a*) **Digits :**

Great toe : save prox. phalanx if possible

Other toes : disarticulate at metatarsal heads

(*b*) **Tarso-metatarsal : Lisfranc**

: Good level

: Planter flap necessary

(*c*) **Tarsal and midtarsal : Bad level**

: All partial amputations post. to tarso-metatarsal joints are unsatisfactory.

(α) Chopart : unstable, painful, deformed

(β) Pirogoff : too long ; bony non-union

(*d*) **Syme's :**

: Through the malleoli just above the articular surface of the ankle joint.

(1) **Good for function :** Laborious work

(2) Painful muscular spasms
(3) Ascending pathology: gas gangrene
(4) **Infection**

(B) **Chronic:**

(1) **Skin: Furunculosis, eczema, ulcer**
Treat: (a) Skin hygiene
(b) Discontinue artificial limb
(c) Paint 1% silver nitrate in 50% alcohol

(2) **Scar:**
(a) **Irritable scar**
(b) **Weak scar:** Ulcerated scar
Etio: (α) Trauma
(β) Infection
(γ) Vascular impairment
(c) Hypertrophied scar: **keloid**
(d) **Adherent scar**
(e) **Infected scar.**

Treat: (1) Excision of the scar
(2) Shortening the bone
(3) Plastic operation on skin

(3) ***Nerve:***
(a) **Painful pseudo-neurofibroma:**
Path: Regenerative overgrowth of cut end of a nerve, due to non-crushing
Clinic: Local pressure pain
Treat: Excision of the bulb

(b) **Adherent nerve:**
Etio: Implication in scar due to non-retraction after cutting
Clinic: Persistent painful stump
Treat: (a) Under-cutting
(b) Higher nerve interruption
(c) Neurolysis

(c) **Ascending neuritis: Causalgia**
Etio: Infection involving sensory nerve endings
Sites: (a) Shoulder disarticulation
(b) Infected stump
Clinic: Causalgia
(a) Intractable neuralgia } ascending
(b) Trophic phenomena }
Treat: (a) Higher nerve interruption
(b) Sympathectomy:
: (α) Periarterial
(β) [illegible] tomy
( ) Poste[illegible] on: Forster

(*d*) **Phantom limb:**

Path: No organic lesion
Clinic: Sensations of absent limb

(4) **Bone:**

(*a*) **Spur formation:**

Etio: (α) Bone infection
(β) Periosteal injury
(γ) Hæmorrhage
(δ) Bone chips

Clinic: Bony swelling with irritation of the stump end

Treat: (α) Prophylactic:
(1) High cutting of periosteum and muscle insertions
(2) Curette the bone marrow
(3) Protection of the soft tissues at the time of sawing

(β) Curative:
(1) Excision
(2) Re-amputation higher up

(*b*) **Osteomyelitis of the bone stump:**

Path: Ring necrosis
Clinic: (α) Non-healing
(β) Sinus
Treat: (*a*) Incision and drainage
(*b*) Curettage
(*c*) Sequestrotomy
(*d*) Local resection

(5) **Muscle:**

(*a*) Contractures
(*b*) Adhesions and fibrosis
(*c*) Wasting

(6) **Bursae:**

Path: Bursitis or bunion
Site: Over the head of the fibula
Treat: Resection of the fibula

(7) **Joint: Ankylosis**

Etio: (*a*) Intra-articular
(*b*) Extra-articular: muscle contractures
Clinic: (1) Flexion knee
(2) Flexion hip
(3) Flexion elbow:
: with loss of pronation and supination
(4) Adduction shoulder:
: with loss of abduction and eversion

Treat: (1) Physiotherapy
(2) Exercises
(3) Tenotomies

(8) **Vasomotor disturbances:**
- (*a*) Cold trophic stump
- (*b*) Irritable hyperæmic stump
- (*c*) Causalgia

(9) **Improper amputations:**
- (A) Improper level:
  - (*a*) Partial amputation of the foot
  - (*b*) Amputation lower third of the leg
  - (*c*) Amputation lower third of the forearm
- (B) Improper techniques:
  - (*a*) Loose flaps
  - (*b*) Bad bone sections
  - (*c*) **Conical stump:**

Etio: (*a*) Growth of bone in children:
Treat: Delay the re-amputation—till adolescence
: Ample soft tissue covering
(*b*) Retraction of soft tissues:
Treat: Adhesive extension
: Higher re-amputation

Secondary operations on amputation stumps:

Time: (1) Good general condition
(2) Absence of local œdema or induration

Operations:

(1) **Plastic closure:**

Ind: Amputation at: (α) Optimum level
(β) Critical level
Contraind: Osteomyelitis of the stump

Tech: Excision of scar and ulcerated area
↓ Mobilisation of skin flaps
↓ Plastic closure

(2) **Plastic resection:**

Ind: (*a*) End osteomyelitis
(*b*) Terminal osteophytes
(*c*) Conical stump

Tech: Excision of scar, sinuses and infected bone
↓ Plastic closure

(3) **Re-amputation:**

Ind: (*a*) Amputation at unsuitable level
(*b*) Infection or gangrene
(*c*) Conical stump

Individual amputations and disarticulations:

(I) SUPERIOR EXTREMITY:

(1) **Amputation of fingers:**

Ind: (*a*) Trauma: (α) Primary: within 24 hours
(β) Secondary: if infection
(*b*) Sepsis: (α) Acute: with septicæmia
(β) Sequelæ: mal-ankylosis
osteomyelitis
(*c*) Vascular impairment: gangrene

Flaps: (1) Thumb: palmar or radial
(2) Index: radial
(3) Middle } equal
(4) Ring } equal
(5) Little. ulnar

Amputation of a digit should be done with a long palmar flap.

Sites:

(A) **Terminal phalanx:** Palmar flap by transfixion
(B) **Second phalanx:** } (*a*) Any suitable flap
(C) **First phalanx:** } (*b*) Cut short the nerves
(*c*) Suture the tendons together

Points: (*a*) It is not necessary to remove cartilage in disarticulations
(*b*) If amputation is proximal to the middle of the second phalanx, flexor and extensor tendons must be sutured together
(*c*) Flapless method is not advised in fingers

After-treat: (1) Splinting should not be done for more than a week
(2) **Early function** is the key-note of success in digital amputations

(D) **Metacarpo-phalangeal *disarticulation*:**

Ind: Labourers: good grip

Tech: (1) Racquet incision: with oval distal to the joint
(α) Flaps:
(*a*) Thumb: long palmar
(*b*) Index: long radial
(*c*) Little: long ulnar
(β) Dorsal metacarpal incision:
(*a*) Index : on the ulnar side
(*b*) Little : on the radial side
(*c*) Others: over the metacarpals
(2) Cut short the tendons
(3) Treat the digital arteries and

(E) Amputation at the metacarpal necks:

Ind: Cosmetic: loss of finger not noticeable
Tech: As in (D) + removal of metacarpal head

(F) Amputation of finger with metacarpus:

Ind: (*a*) Fracture metacarpus
+ Injured flexor tendons
(*b*) T. B.
(*c*) Osteomyelitis
Tech: (1) Racquet incision
(2) Dorsal approach:
(*a*) Extensor tendons
↓ (*b*) Subperiosteal bone excision
↓ (*c*) Flexor tendons

(G) Amputation of the thumb:

(*a*) **Avoid at all costs**
(*b*) Conserve as much bone as possible
(*c*) Preserve or re-attach muscle insertions
(*d*) Palmar or radial flap
Thumb replacement methods:
(1) Digitalising first metacarpal
(2) Nicoladani. transfer of great toe
(3) Albee: two stage: (*a*) Tibial bone-graft
↓ (*b*) Skin-graft

(2) Amputations near the wrist:

(A) Amputations through the carpus and metacarpus:

Ind: (*a*) Mobile wrist joint
(*b*) Good for mechanism of artificial hand

(B) Disarticulation of the wrist: Bad level

Ind: (*a*) Severe trauma to the hand
(*b*) Extensive sepsis in carpus and metacarpus
Disadvant: Stump too long
Advantage: Pronation and supination possible
Tech: (1) Single palmar flap:
(*a*) Exclusive: skin and fascia
or (*b*) Inclusive: muscles
(2) Disarticulation from dorsum
(3) Excision of styloids
(4) Tendons cut short or sutured
(5) Vessels and nerves treatment
(6) Suture

(3) Amputations through the forearm:

Ind: (*a*) Extensive trauma to hand and wrist
(*b*) Advanced T. B. wrist
(*c*) Gangrene or acute sepsis hand
(*d*) Recurrent giant-cell tumour lower end radius

Level: (*a*) **Optimum:**
(α) Junction of middle and lower third
(β) **8 inches from olecranon tip**
(γ) 5 inches from biceps insertion
(*b*) **Critical:**
(α) **5 inches from olecranon tip**
(β) 2 inches from biceps insertion

Tech: (1) Flap: equal antero-posterior
(2) Free stripping of periosteum
(3) Vessels: (*a*) Radial
(*b*) Ulnar
(*c*) Interosseous
(4) Nerves: (*a*) Radial
(*b*) Median
(*c*) Ulnar
(5) Suture muscle-ends over and in between the bone-ends

After-treat: Fixation in supination

Compl: Fusion of bone-ends

(4) Disarticulation at the elbow:

Ind: (*a*) Extensive injuries of the forearm
(*b*) Infection and gangrene

Advantage: Better hold for artificial limb

Disadvantage: Sensitive, irregular, bulbous end

Tech: (1) Flap:
(*a*) Circular:
: 3 finger breadth below joint line
(*b*) Elliptical
(*c*) Posterior flap
(2) Division of soft tissues
(3) Disarticulation:
: from anterior and outer aspect
(4) Treatment of vessels, nerves, muscles
(5) Closure

(5) Amputation through the arm:

Ind: (*a*) Severe trauma
(*b*) Severe sepsis or gangrene
(*c*) Advanced T. B. elbow
(*d*) Neoplasms

Levels: (1) **Optimum:**
(*a*) Supracondylar
(*b*) 1 inch above the epicondyles
(*c*) **8 inches from the axillary fold**
(2) **Critical: 4 inches from the axillary fc**

Tech: (A) **Amputation arm supra-condylar:**

(1) Flap:
(a) Anterior: to antecubital fold
(b) Posterior: 5 inches below olecranon
(2) Division of tendons:
(a) Biceps: at the level of elbow
(b) Triceps: at the insertion
(3) Division of all soft tissues:
: Upto the bone
: At the level of bone section
(4) Bone section:
: One inch above the epicondyle
: Remove the supra-condylar ridges
(5) Ligature of brachial vessels
(6) Nerves: median; radial; ulnar;
: musculocutaneous.
(7) Hæmostasis
(8) Tendino-plastic: biceps with triceps
(9) Closure.

(B) **Amputation through critical level of arm:**

(1) Racquet flap incisions:
Vertical: Along delto-pectoral split
Lateral: Deltoid flap
Medial: One inch below axilla
or, (1) Circular method
(2) Ligature of brachial vessels
(3) Bone section: below surgical neck
(4) Treatment of vessels and nerves
(5) Muscle suture: deltoid-medial muscles
(6) Closure

(6) **Disarticulation at shoulder joint:**

Ind: (a) Extensive trauma to humeral head
(b) Malignant tumour of the humerus
(c) Complete brachial plexus paralysis

(A) **Spence's method:** Anterior racquet

(1) Incisions:
(a) Vertical incision:
: Along the delto-pectoral interval
: From coracoid downwards
+ (b) Circular incision: at the axillary folds
(2) Dissection of internal flap
(3) Division of soft structures:
(a) Vessels
(b) Nerves
(c) Muscles
(4) Dissection of external flap with deltoid

(5) Disarticulation : from anterior aspect
- (a) Open the capsule anteriorly
- (b) Division of both heads of biceps
- (c) Division of tuberosity muscles
- (d) Removal of the humerus

(6) Closure

(B) **Furnaux–Jordan method:**
: High circular arm amputation
↓ Dissection of humeral head

(7) **Fore-quarter interscapulo-thoracic disarticulation of Berger:**

Ind : (1) Sarcoma of the shoulder or scapula
(2) Intractable and unbearable neuralgia and paralysis due to malignant infiltration of brachial plexus.
(3) Brawny arm of carcinoma breast

(A) **Superior:**
- (a) Incision : along the upper border of inner two-thirds of clavicle
- (b) Division: at the middle of the clavicle
- (c) Exposure and ligature of vessels and nerves

↓ (B) **Anterior:**
- (a) Incision: coracoid → anterior axillary fold → axilla → inferior scapular angle
- (b) Dissection of anterior flap
- (c) Division of pect. major near the thorax
- (d) Dissection of axilla

↓ (C) **Posterior:**
- (a) Incision: outer end of the clavicle ↓ inferior angle of the scapula
- (b) Dissection of posterior flap
- (c) Division of scapulo-vertebral muscles

↓ (D) Removal of the limb
↓ (E) Closure with drainage

(II) INFERIOR EXTREMITY :

(1) **Amputation of toes:**

(A) **Terminal phalanx:**
Ind : (a) Deformity
+ (b) Painful corn or ulcer or nail
Tech: Single plantar flap

(B) **Partial** amputations : undesirable : except in hallux

(C) **Metatarso-phalangeal disarticulation:**
Ind : Any amputation proximal to distal phalanx except in hallux
Tech : Racquet incision with dorsal handle

(1) **Hallux :**

Tech : (*a*) Racquet incision :
(α) Handle on outer side
(β) Medio-plantar flap bigger
(*b*) **Preserve first phalangeal base**
(*c*) Suture the tendons over the bone

(2) **Little toe :**

Tech : Racquet incision :
(α) Handle on inner side
(β) Latero-plantar flap

(3) **Any three toes amputation :**

: Remove all toes
: Remove fifth metatarsal head

(2) **Amputations through the foot :**

(A) Through the metatarsu :

: Excision of the head of the metatarsus with the toe results in impairment of function especially in first metatarsal.

(B) Through the tarso metatarsus :

(1) Lisfranc Disarticulation through tarso-metatarsal joints
(2) Hey : Lisfranc with amputation of second metatarsal base
(3) Skey :

Def : Disarticulation of outer three metatarsals
+ Amputation through inner bones
Level. Good for heavy laborious work
Tech : Long plantar flap

(C) Through the tarsus :

: Chopart : Def : Disarticulation at midtarsal joints
Level : Bad : (*a*) Unstable, painful stump
(*b*) Equino-varus contracture
Tech : Long plantar flap

(3) **Amputation at the ankle joint :**

(A) **Symes :**

Def : Supra-malleolar amputation through the lower ends of the tibia and fibula just above the ankle joint with heel flap

Level : (*a*) Good for function
(*b*) Bad for cosmetics

Advantages : (*a*) Direct weight bearing
(*b*) Maximum leverage power
(*c*) Less mutilating
(*d*) Permits appliance

Disadvantage : Unsightly bulbosity

Ind : Hard laborious working people

Contraind : Where cosmetic results are required

Tech : (1) Incision :
- (a) Half inch below the int. malleolus
- ↓ (b) One inch in front of the heel
- ↓ (c) Tip of ext. malleolus
- ↓ (d) Across the front of the joint

(2) Division of soft tissues upto capsule and bone

(3) Disarticulation :
- (a) Anterior ligaments
- (b) Lateral ligaments
- (c) Posterior ligaments
- (d) *Tendo achillis*

(4) Dissection of os calcis :
: Strip off tendo Achillis and fat

(5) Removal of lower ends of leg bones :
- (a) Half to three-fourth inch above the articular surface
- (b) At right angles to long axis

(6) *Ligature and treat. of vessels, nerves, tendons* :
- (a) Keep post. tibial artery as long as possible
- (b) Cut the tendons short

(7) Closure with drainage :
: Trim the flap carefully

After-treat : (1) Walking in six weeks
(2) Elephant boot

Complications : (a) Callosities, (b) Neuritis, (c) Circulatory failure } After 8–10 years
Treat : Re-amputation

Modified Symes :

Advant : (1) Good cosmetics : no bulbous end
(2) Good artificial limb

Tech : (1) Oval flap from the crease on the anterior aspect of junction of the foot and the leg, across the tips of the malleoli, to about one inch on the sole
(2) Dissection of all the soft parts from above downwards with the knife against the bone
(3) Bone section ¾ to 1 inch above the articular surfaces of tibia and fibula

(B) Pirogoff : Syme's with conservation of a part of os calcis :
: osteoplastic

(C) Watson : Syme's with conservation of whole of os calcis :
: osteoplastic

(4) Amputation through the leg:

Level: (1) Optimum:
- (*a*) Mid leg
- (*b*) 7 inches from the upper art. surface of tibia
- (*c*) Stump should project beyond the thigh at the back when flexed to a right angle

(2) Critical:
- (*a*) 3 inches from the upper art. surface of tibia
- (*b*) 2 inches from biceps insertion

(A) Mid leg or optimum level amputation:

(*a*) Incision:
- (α) Single anterior flap
- (β) Long anterior + short posterior flaps

(*b*) Muscles:
- (α) Cut the posterior muscles at the level of bone section
- (β) Cut gastrocnemius three inches below

(*c*) Bones:
- (α) Fibula: cut first: ·5–1 inch above
- (β) Tibia: division with smoothening

(*d*) Vessels & nerves: ligature
- (α) Vessels: ant. & post. tibials; peroneal
- (β) Nerves: anterior and posterior tibials
musculocutaneous
posterior saphenous

(*e*) Tendino-plastic technic:
: Suture of gastrocnemius

(*f*) Suture and closure

(*g*) After-treat:
- (α) Knee fixed in extension
- (β) Art. limb:
  : Pressure taken by head of the tibia and lower border of patella

(B) Upper third or critical level amputation:
- (*a*) Lateral equal flaps
- (*b*) Total removal of fibula

(C) Amputation leg above the critical level:
- (*a*) Amputate above the knee
- or (*b*) Peg leg with flexed knee

(5) Amputations round about the knee:

(A) Disarticulation at the knee: Stephen Smith:

Advant: (*a*) Urgent life saving measure
- (*b*) Accustomed to bear weight on the anterior surface of fully flexed knee

Disadvant: (a) Bulbous end
(b) Good artificial limb cannot be fitted

Tech: (a) Flaps: (α) Lateral
(β) Single anterior
(b) Division of: (α) ligament patella
(β) lateral ligaments
(γ) cruciate ligaments
(δ) capsule
(c) Ligature of vessels and nerves
(d) Leave in the semilunar cartilages

(B) Condylar Amputations:
(1) Carden: Amputation at the level of adductor tubercle covered by anterior flap containing patella
(2) Tendino-plastic:
Def: Amputation slightly above the adductor tubercle covered by quadriceps tendon
Tech: Anterior flap upto middle of the patella
(3) Stokes-Gritti:
Def: Amputation slightly above the adductor tubercle with ankylosis of lower cut end with patella
Level: Amputation of choice
Advantage: Perfect end bearing stump
Tech: (1) Long anterior flap:
: From just above the adductor tubercle to tibial tubercle
: Consisting of skin, patella, tendon and capsule
(2) Division of soft tissues upto bone
(3) Periosteal and bone section:
: One inch above the adductor tubercle
(4) Freshening of patellar surface
(5) Dissection of supra-patellar synovial pouch
(6) Vessels and nerves:
(a) Popliteal vessels
(b) Nerves: ext. and int. popliteal; saphenous
(7) Suture of patella to femoral end
After-treat: (1) Dressings
(2) End pressure exercises
(3) Temporary prosthesis: at the end of 4 weeks

(6) **Amputations through the thigh:**

Ind: (1) Trauma
(2) Gangrene: foot or leg
(3) Acute infections
(4) T.B. knee
(5) Malignancy below the knee

Levels: (A) Optimum: 10 to 11 inches from the perineum
(B) Critical: (a) Junc. of upper and mid. third
(b) 4 inches from the perineum

(A) **Optimum level or supra-condylar amputation:**

(1) Any flap = (Diameter of cross-section)
: Usually antero-posterior

(2) Division of soft tissues:
: Hamstrings and adductors lower than quadriceps

(3) Division and stripping of periosteum

(4) Division of bone:
(*a*) 10–11 inches from the perineum
or (*b*) 2·5–3 inches above the knee

(5) Vessels and nerves:
(*a*) Vessels: femoral artery
profunda femoris artery
saphenous vein
(*b*) Nerves: sciatic
saphenous
external and internal cutaneous

(6) Suture of hamstrings to quadriceps

(7) Closure with drainage

After-treat: **Prevent flexion contracture of the hip**

(B) **Critical level or mid-thigh amputation:**

(*a*) Flaps:
(α) Anterior 6 inches more than posterior
or (β) Antero-lateral / Postero-medial } equal flaps

(*b*) Suture anterior and posterior muscles over the stump

(*c*) Avoid spur formation

After-treat: (1) Prevent flexion contracture of hip
(2) Pylon for 6 months
(3) Artificial limb:
: Metal or wood bucket, attached by side-steels to leg and foot pieces, with movable joints

(7) ***Disarticulation at the hip Joint:***

Ind: (1) Extensive trauma
(2) Extensive necrosis of femur
(3) Ascending gas gangrene
(4) T. B. hip with suppuration
(5) Sarcoma of the femur
(6) Flail limb
+(7) General health good

Preoper: (*a*) Blood or saline transfusion
(*b*) Control of hæmorrhage:
+ (α) Tight Esmarch bandage from toes to operation field
↓ (β) Clamp before ligature

or (γ) Digital or instrumental pressure
or (δ) Preliminary ligature

(A) **Anterior racquet** method:
: Long postero-medial flap

(B) **Posterior flap: Fitz-Maurice Kelly:**
- (*a*) Incision: anterior, parallel with Poupart
- (*b*) Preliminary clamping of vessels and nerves
- (*c*) Posterior skin flap: length=diameter
- (*d*) Division of soft tissues upto the joint:
  - (α) Antero-lateral muscles
  - (β) Trochanteric muscles
  - (γ) Iliopsoas and pectineus
- (*e*) Capsulotomy and:
  - (α) Disarticulation
  - or (β) Trans-cervical amputation
- (*f*) Division of postero-medial muscles
- (*g*) Ligature of:
  - (α) Vessels: external iliac
  - (β) Nerves: femoral
    - sciatic
    - small sciatic
    - obturator
    - gluteal
- (*h*) Suture with drainage

(C) **Furnaux-Jordan:**
- (*a*) Incision:
  - (α) Circular at the junction of upper and middle third
  - (β) Outer vertical over the great trochanter
- (*b*) Amputation at the level of circular incision
- (*c*) Dissection of the upper part of the femur
- (*d*) Closure

(D) **Hamilton Bailey:**
- (*a*) Incision: vertical over the femoral vessels from Poupart downwards
- (*b*) Ligature of femoral vessels
- (*c*) Circular incision:
  - (α) 4 inches below the perineum
  - (β) Below the trochanter major base
  - (γ) Below the fold of the buttock
- (*d*) Dissection of skin and fascia
- (*e*) Division of muscles upto the bone
- (*f*) Capsulotomy
- (*g*) Dislocation of femoral head:
  - or: Osteotomy of femoral neck
- (*h*) Closure with trimming of flaps

Artificial limb: 'Tilting table' limb with thigh, leg and foo pieces hinged together and with pelvic an shoulder bands.

(8) Hind-quarter or Inter-innomino-abdominal:

Ind: Tumours of: (a) Innominate

(b) Upper end of the femur

Tech: (a) Preliminary blood transfusion

(b) Preliminary control of external iliac vessels

(c) Efficient nerve block

(d) Division of symphysis pubis

(e) Sawing through dorsum ili near the sacro-iliac joint

IMPORTANT POINTS

(1) Primary amputations or those delayed only for 24 to 48 hour should be performed as nearly as possible at the seat o injury by simple section of the soft parts or with sligh trimming of the bone.

(2) Ampulations for infection should be performed by simple cros section or with very short flaps fixed in eversion.

(3) For above-knee amputations the length of the functioning stump for limb-fitting purposes should be taken from the perineum.

(4) For below-knee amputations the limit of useful length is that amount of stump which can be retained in the below-knee socket when the knee is flexed to 90 degrees.

(5) Length of the below-knee stump available for fitting of the socket is to be measured from the lower border of the biceps tendon with knee in right angled flexion.

(6) Length of the forearm stump for fitting an appliance is *measured from the insertion of biceps tendon,* with elbow at right angles, and must be 5 to 6 inches below that point.

(7) Where as in the lower limb, it is often advisable to sacrifice unnecessary length in order to preserve a good weight bearing stump, in the upper limb, length should be preserved at all costs.

(8) Average time for shrinking of the stump is three months.

(9) Prosthetic appliances are not extensively used in cases of amputations of the upper extremity, as the work of the hand cannot be substituted by any appliance. In lower limb, always secure a stump suitable for prosthesis.

(10) Total length of the flap or flaps should be a bit more than the diameter of the limb at the level of the bone section. Flaps should fit the bone-ends snugly—not too tight; not too loose.

(11) Subcutaneons tissues and deep fascia always, and muscles and sesamoid bones sometimes should be included in flaps.

(12) Terminal scar is better in the upper extremity; while a posterior scar is more desirable in the lower limb. Scar should always be situated in the region of minimum pressure and irritation.

(13) End bearing stumps:
  (a) Syme
  (b) Stokes-Gritti
  (c) Supra-condylar tendino-plastic amputation of thigh

(14) In the lower limb, stump must be weight bearing. In the upper limb, stump must be mobile.

(15) No artificial limb should be worn till irritation, œdema or infection of the stump is fully eradicated.

(16) Any appliance for an amputation stump should not be accepted by a patient, until it has been tried on in the presence of and is approved by the surgeon.

(17) Aperiosteal technique should not be followed in infected or open amputations, for fear of necrosis.

(18) Injection of absolute alcohol in the nerve one inch above the plane of section is more successful in preventing neuroma formation than any other method.

(19) Nerve syndrome in amputation stumps:
  (a) Local: pain and tenderness
  (b) Distal: phantom limb
  (c) Proximal: causalgia: ascending neuralgia

(20) There is no single factor as important as traction in the after-treatment of amputation wounds; and it should be employed whenever there is slightest indication for it: viz.
  (a) Tension on sutures
  (b) Retraction of flaps
  (c) Infection.

(21) Toes: (a) Always preserve first phalangeal base in amputations of hallux.
  (b) Do not excise heads of first and last metatarsals.
  (c) Amputation of 2nd and 3rd toe is followed by hallux valgus.

(22) Lisfranc is the only partial amputation of the foot that should ever be performed.

(23) When amputation of the foot is required and Lisfranc is impossible, the choice should lie between:
  (a) Syme's amputation
  (b) Midleg or site-of-election amputation.

(24) Syme's amputation is the best weight bearing stump ampu tion in the lower extremity but can only be done when t skin of the heel is healthy.

(25) *Average life of Syme's amputation is 8 to 10* years, af which re-amputation is needed.

(26) In every amputation of the lower leg, fibula should be cut c inch above the tibia, in short stumps, excise the whole the fibula.

(27) Most common fault in disarticulation of the hip joint is dundancy of soft tissues; the chief complication is hæm rhage, which is prevented by preliminary ligature of comm femoral art.

(28) Pre-operative tight Esmarch's bandage from the toes to t operation area saves as much blood as can be gained l moderate transfusion.

(29) Fingers : (*a*) Preserve thumb at all costs

(*b*) Any portion of a finger is worth retaining pr vided remaining joints are mobile.

(*c*) Æsthetic purposes : excise metacarpal head
Functional purposes : leave in metacarpal hea

(*d*) If the amputation of a digit is proximal to tl middle of the second phalanx, flexors an extensors must be sutured together.

(*e*) Avoid any scar on palmar aspect.

(30) Advantage of disarticulation at the wrist over amputation a higher level is that pronation and supination are possible the disadvantage being the long stump.

(31) In cases of crush trauma to the hand, trim and clean up a *thoroughly as possible, but do not remove any part* that ha chance to survive.

(32) No part of hand should ever be removed merely to obtai skin closure. *It may be left to granulate or be skin-grafted.*

(33) No amputation of the forearm should be done at a leve which leaves less than 2 inches of ulna.

(34) Prevent fusion of bone stumps in amputations through th forearm.

(35) *Amputation of forearm* should be done below the insertio of pronator teres, with at least 3 inches of ulna in the stump.

(36) It is inadvisable to perform elbow disarticulation in malig nancy of the forearm.

(37) In amputations through the arm, the longer the stump the greater the control of artificial limb.

(38) Disarticulation of the shoulder is better when prosthesis is used; amputation through the upper third of the arm is better when prosthesis is not used.

(39) Different positions during amputations:

(1) Leg: flexion of the knee.
(2) Thigh: flexion of the hip.
(3) Forearm: (a) extension of the elbow.
(b) supination of the forearm.
(4) Elbow: (a) flexion to right angle.
(b) supination of the forearm.
(5) Arm: abduction to right angle.
(6) Shoulder: (a) abduction to right angle.
(b) eversion.

(40) Good levels:

(1) Base first phalanx of the hallux.
(2) Lisfranc.
(3) **Syme.**
(4) **Midleg:** 7 inches from upper tibial articular surface.
(5) Stokes-Gritti.
(6) **Supra-condylar** tendino-plastic: 10 to 11 inches from the perineum.
(7) Disarticulation hip.
(8) Metacarpal region of the hand.
(9) **Junction of middle and lower third of forearm:** : 8 inches from olecranon tip.
(10) **Supra-condylar humeral:** : 8 inches from axillary fold.

(41) Bad levels:

(1) Excision of heads of first or fifth metatarsals.
(2) Chopart.
(3) Lower third of the leg.
(4) Disarticulation knee.
(5) Amputation thumb.
(6) Amputation round about wrist.
(7) Disarticulation elbow.

(42) Critical levels:

(1) Leg: 3 inches from the upper tibial articular surface.
(2) Thigh: junction of upper and middle third.
4 inches from the perineum.
(3) Forearm: 5 inches from olecranon tip.
(4) Arm: 4 inches from the axillary fold.

(43) Mortality in amputations is in indirect proportion to the nearness of the amputation sites to the trunk.

PART II

REGIONAL SURGERY

CHAPTER I

THE SCALP AND THE SKULL

(A) THE SCALP

(I) CONGENITAL ABNORMALITIES OF THE SCALP:

DERMOID CYSTS:

Sites: (1) Midline: (*a*) External occipital protuberance
(*b*) Anterior fontanelle
(*c*) Root of the nose
(2) **External orbital:**
(3) Mastoid:

Path: Squamous celled wall with sebaceous contents

Clinic: (1) **Site**
(2) Globular cystic swelling
(3) **No adhesions to skin or deeper structures**

Diff. diag.: (1) Sebaceous cyst
(2) Cold abscess
(3) Meningocele
(4) Encapsuled lipoma

Sequelæ: (1) Infection: suppuration and ulceration
(2) Bone absorption
(3) Communication with intra-cranial part

Treat: Excision. after puberty

(II) TRAUMA TO THE SCALP:

(1) CONTUSIONS AND HÆMATOMA OF THE SCALP:

(A) **Subcutaneous:**

Clinic: (*a*) *Hard margins pitting on pressure*
(*b*) **Swelling movable on the skull**
(*c*) No open wound

Diff. diag: **Depressed fracture**
Treat: Leave alone
Compl: Intra-cranial

(B) **Sub-aponeurotic:**

Etio: (1) **Primary:** Blows on the head
(2) **Secondary:** Safety-valve hæmatoma
: Fracture skull vault in children

Clinic: Bag of fluctuating swelling under the scalp and over the cranium **limited by insertions of galea aponeurotica**

Viz: (a) Supra-ciliary ridges
(b) Temporal ridges
(c) Superior occipital ridges

Diff. diag.: (1) Sub-pericranial hæmatoma
(2) **Safety-valve hæmatoma**
(3) Cellulitis scalp
(4) Hydro-cephalus

Compl: (1) **Blood absorption toxæmia**
(2) *Infection: and its sequelæ*
(3) ***Intra-cranial:***
(a) Primary traumatic
(b) Secondary to infection

Treat: (1) Conservative: application of cold; pot. iodide
(2) Operative: Evacuation
Ind: (α) Tenderness and fever
(β) Infection

(C) Sub-pericranial: Cephal-hæmatoma:

Etio: (1) Difficult labour
(2) Trauma

Clinic: (1) Fixed tender swelling:
(a) Hard raised margins
(b) Central soft depression
(2) **Limitation to one bone**

Diff. diag: (1) **Depressed fracture**
(2) Subcutaneous hæmatoma
(3) Cephal-hydrocele: traumatic meningocele

Compl: (1) Delayed absorption
(2) Infection: suppuration and osteomyelitis
(3) **Ossification:**
Diff. diag. Any tumour of the skull

Treat: Conservative

(2) WOUNDS OF THE SCALP:

Etio: (1) **Incised**
(2) **Contused:** Blunt trauma
(a) **Simulate incised wound**
(b) Association with local depressed fracture
(c) **Always probe**

Compl: (1) **Hæmorrhage**
(2) **Sepsis:** Suppuration or cellulitis or osteomyelitis
(3) **Associated fracture skull**
(4) ***Intra-cranial** complications*

Treat: (1) Shave the whole head
(2) **Debridement**

(3) Exploration: treat underlying pathology
(4) **Loose stitches**
(5) **Wet dressings**

(3) AVULSION OF THE SCALP:

Etio: Ladies in mill accidents

Treat: (1) Replacement and suture
(2) Cushing's method:
: Tripod incision sutured Y
(3) Thiersch's grafting

(4) TRAUMATIC ANEURYSM OF THE SCALP:

Site: **Temporal artery**

Clinic: (*a*) History of local trauma with local contusion
↓ (*b*) Pulsating swelling:
. In the line of temporal artery

Treat: (1) Double ligature
(2) Excision

(III) INFECTIONS OF THE SCALP:

(A) LOCAL SEPSIS OF THE SCALP:

(1) BOILS: (See under skin and subcut. tissues)

(2) CARBUNCLES:

Site: Nape of the neck

Clinic: (See under skin and subcut. tissues)

Compl: (1) Regional: cranial and intra-cranial
(2) (See under skin and subcut. tissues)

Treat: (See under skin and subcut. tissues)

(3) INFECTED SEBACEOUS CYSTS OR DERMOIDS:

Clinic: (1) Inflamed swelling: with
(*a*) Sinus discharging putrid discharge
(*b*) Fungating ulceration:
: **"Cock's peculiar tumour"**
(2) History of previous non-inflamed swelling

Diff. diag: **Epithelioma**

Treat: **Excision:** After subsidence of acute phase

(4) SEPTIC WOUNDS:

Clinic: (*a*) Tenderness and tension under the wound
(*b*) Bogginess round about
(*c*) General toxæmia

Treat: Ample drainage by **removal of sutures**

(B) REGIONAL SEPSIS OF THE SCALP:

(1) SEPTIC WOUNDS: (See above)

(2) SUB-PERICRANIAL SUPPURATION:

Etio: (*a*) Infected cephal-hæmatoma
(*b*) Underlying osteomyelitis
(*c*) Septic wounds
Clinic: Inflammatory swelling: limited to one bone
Compl: Cranial and intra-cranial
Treat: Early Incision and evacuation

(C) GENERAL SEPSIS OF THE SCALP:

(1) ERYSIPELAS OF THE SCALP:

(See under erysipelas)
Clinic: (*a*) Palpably raised red swelling of the skin
(*b*) Regional lymphadenitis
(*c*) General toxæmia
Special compl: Cranial and intra-cranial
Treat: (See under erysipelas)

(2) CELLULITIS OF THE SCALP:

Etio: Primary local focus:
: Boil or infected scratch
Clinic: (*a*) Local: extensive inflammatory œdematous swelling of the scalp
(*b*) General: acute toxæmia
Special compl: Cranial and intra-cranial
Treat: (See under cellulitis)

(3) SUB-EPICRANIAL SUPPURATION:

Etio: Infected sub-epicranial hæmatoma
Path: Bag of pus under galea aponeurotica
Clinic: (*a*) Inflammatory fluctuating swelling:
: Limited by insertions of the galea
(*b*) Acute toxæmia
Diff. diag: Sub-epicranial hæmatoma
Special compl: Cranial and intra-cranial
Treat: Early incision and evacuation

(IV) CYSTIC SWELLINGS OF THE SCALP:

(1) DERMOIDS: (See above)

(2) SEBACEOUS CYSTS:

Clinic: (*a*) Non-localisation to midline or sutures
(*b*) **Adhesion to skin at one point**
(*c*) Multiple
Diff. diag: (*a*) **Dermoid cysts**
(*b*) Meningoceles
(*c*) **Cold abscesses**
(*d*) **Encapsuled lipomata**
(*e*) Cavernous angiomata

Compl: (*a*) Infection
(*b*) Ulceration: Cock's peculiar tumour
(*c*) Malignancy
(*d*) Horns
Treat: Excision

(3) MENINGOCELES:
: (See under central nervous system)

(4) HYDROCEPHALUS:
: (See under central nervous system)

(V) NEW GROWTHS OF THE SCALP:

(See also under respective tumours)

(A) *Mesoblastic tumours:*

(1) ANGIOMA OF THE SCALP:

Varieties: (A) **Capillary**: Nævi, birth marks
(B) **Cavernous:**
(*a*) Sponge-like
(*b*) **Compressible**
(*c*) Pseudo-inflammatory
(C) **Plexiform**: Tortuous mass of pulsating vessels
Sites: Temporal artery, orbit
(D) **Lymphangioma**

Diff. diag: (*a*) Cystic swellings:
: Dermoids, sebaceous cysts, meningoceles, cold abscesses
(*b*) Soft encapsuled growths:
: Lipomas, fibromas
(*c*) **Local sub-acute inflammations**

Compl: (*a*) Baldness
(*b*) Ulceration → **hæmorrhage**

Treat: (*a*) **Excision:**
: Put in continuous or blanket sutures all round the cut margins to check hæmorrhage
(*b*) **Ligature of tributaries**
(*c*) Carbon-dioxide snow
(*d*) **Deep X-Ray therapy**
(*e*) Electrolysis
(*f*) **Radium**

(2) FIBROMA OF THE SCALP:

Varieties: (A) Molluscum fibrosum
(B) Fibroma of the galea aponeurotica
(C) Neuro-fibroma:
(*a*) Local
(*b*) Plexiform
(D) Pure fibroma

(2) SUB-PERICRANIAL SUPPURATION:

Etio: (*a*) Infected cephal-hæmatoma
(*b*) Underlying osteomyelitis
(*c*) Septic wounds
Clinic: Inflammatory swelling: limited to one bone
Compl: Cranial and intra-cranial
Treat: Early incision and evacuation

(C) GENERAL SEPSIS OF THE SCALP:

(1) ERYSIPELAS OF THE SCALP:
(See under erysipelas)

Clinic: (*a*) Palpably raised red swelling of the skin
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(*c*) General *toxæmia*
Special compl: Cranial and intra-cranial
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Special compl: Cranial and intra-cranial
Treat. (See under cellulitis)

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Etio: Infected sub-epicranial hæmatoma
Path: Bag of pus under galea aponeurotica
Clinic: (*a*) Inflammatory fluctuating swelling:
: Limited by insertions of the galea
(*b*) Acute toxæmia
Diff. diag: Sub-epicranial hæmatoma
Special compl: Cranial and intra-cranial
Treat: Early incision and evacuation

(IV) CYSTIC SWELLINGS OF THE SCALP:

(1) DERMOIDS: (See above)

(2) SEBACEOUS CYSTS:

Clinic: (*a*) Non-localisation to midline or sutures
(*b*) **Adhesion to skin** at one point
(*c*) Multiple
Diff. diag: (*a*) **Dermoid cysts**
(*b*) Meningoceles
(*c*) **Cold abscesses**
(*d*) **Encapsuled lipomata**
(*e*) Cavernous angiomata

Compl: (*a*) Infection
(*b*) Ulceration: Cock's peculiar tumour
(*c*) Malignancy
(*d*) Horns
Treat: Excision

(3) MENINGOCELES:
: (See under central nervous system)

(4) HYDROCEPHALUS:
: (See under central nervous system)

(V) NEW GROWTHS OF THE SCALP:

(See also under respective tumours)

(A) *Mesoblastic tumours:*

(1) ANGIOMA OF THE SCALP:

Varieties: (A) **Capillary:** Nævi, birth marks
(B) **Cavernous:**
(*a*) Sponge-like
(*b*) **Compressible**
(*c*) Pseudo-inflammatory
(C) **Plexiform:** Tortuous mass of pulsating vessels
Sites: Temporal artery, orbit
(D) **Lymphangioma**

Diff. diag: (*a*) Cystic swellings:
. Dermoids, sebaceous cysts, meningoceles, cold abscesses
(*b*) Soft encapsuled growths:
: Lipomas, fibromas
(*c*) **Local sub-acute inflammations**

Compl: (*a*) Baldness
(*b*) Ulceration → **hæmorrhage**

Treat: (*a*) **Excision:**
: Put in continuous or blanket sutures all round the cut margins to check hæmorrhage
(*b*) **Ligature of tributaries**
(*c*) Carbon-dioxide snow
(*d*) **Deep X-Ray therapy**
(*e*) Electrolysis
(*f*) **Radium**

(2) FIBROMA OF THE SCALP:

Varieties: (A) Molluscum fibrosum
(B) Fibroma of the galea aponeurotica
(C) Neuro-fibroma:
(*a*) Local
(*b*) Plexiform
(D) Pure fibroma

Clinic: (a) Local encapsuled:
(α) Diff. diag. from cystic swellings
(β) Bone absorption
(b) Diffuse: neuro-fibroma
Sites: (a) Orbital region
(b) Temporal region
(c) Auricular region

(3) LIPOMA OF THE SCALP:

Varieties: (1) Local encapsuled:
(a) False fluctuation
(b) Bone absorption
(2) Diffuse:
Site: Occipital region

Compl: Underlying defect of the cranium:
: Meningocele

(4) FIBRO-SARCOMA OF THE SCALP:

Path: Diffuse epicranial or scar fibro-sarcoma

Clinic: Multi-lobulated and diffuse growth of the scalp with baldness

(5) CYLINDROMA OF THE SCALP:

Syn: Turban tumour

Path: ? Baso-cellular carcinoma
? Endothelioma

Clinic: Extensive turban-like nodular swelling involving greater part of the scalp

(B) *Epiblastic tumours:*

(1) PAPILLOMA:

Clinic: **Warts**

Compl: (a) Irritation
(b) Sepsis
(c) Malignancy

(2) SQUAMOUS CARCINOMA:

Etio: (a) Papilloma
(b) Chronic ulcerated sebaceous cyst
(c) Chronic ulcer

Clinic: (a) **Ulcerative**
(b) **Warty**

Diff. diag: (a) Papilloma
(b) Ulcerated cysts or growths

Treat: (1) Surgical: radical excision with lymph glands
(2) Radium

(C) *Transitional or basal-celled tumour :*

(1) RODENT CARCINOMA:

Path: (*a*) Outermost layer of columnar epithelium
(*b*) No cell nests

Clinic: (*a*) **Ulcerous: Rodent ulcer**
Site: Frontal, temporal
Clinic: (i) **Slowly spreading, painless, relentless ulcer with slightly raised or beaded edges** ultimately eroding the bone and exposing the intra-cranial contents
(ii) **No enlargement of regional lymph glands**
(*b*) Tuberous: nodular

Treat: (1) **Radium**: 40–80 mgm. hours per square cm.
(2) Deep X-Rays

(2) MELANOMA MALIGNUM:

Def: Malignant growth containing melanin
Etio: (*a*) Primary
(*b*) Secondary to mole

Path: (1) **Melanotic carcinoma:**
Path: Epithelial
Metastases: Lymph glands
(2) **Melanotic sarcoma:**
Path: Mesothelial
Metastases: Lungs, brain, liver

Clinic: (1) **Local**: Insignificant focus, hidden by hair:
(α) Pigment patch
(β) Extending or ulcerating mole
(2) **Secondaries:**
(*a*) Enlarged regional lymph glands
or (*b*) Lung signs
Liver enlargement
Brain signs

Treat: (1) Preventive excision of pigment patches or moles
(2) Radium
(3) Deep X-Rays

(B) THE SKULL

(I) CONGENITAL ABNORMALITIES:

(1) LOCAL DEFECTS: Associated with **meningocele**

(2) REGIONAL DEFECTS: **Sinus pericranii:**

Def: Prolongation of anterior longitudinal venous sinus through ununited frontal suture

(4) Bone:
- (*a*) Detach the pericranium
- (*b*) Inspection of fracture
- (*c*) Treatment of fracture:
  - (1) Leave alone: fissured fracture
  - (2) Simple elevation: depressed fracture
  - (3) Trephining and elevation
  - (4) Simple excision
  - (5) Trephining *en block*:
    - Ind: (1) Small depressed fracture
    - (2) Fracture over sinuses
    - (3) Pond and gutter fractures
    - (4) Punctured fracture
    - (5) Potential sepsis
- (A) Preservation of bone:
  - Ind: (*a*) Pieces not devoid of periostium
  - (*b*) No potential compression
  - (*c*) No potential sepsis
  - (*d*) Defect extensive
- (B) Excision of bone:
  - Ind: (*a*) Pieces devitalised
  - (*b*) Potential compression
  - (*c*) Potential sepsis
  - (*d*) Defect limited

(5) Dura: Open: only if:
- (*a*) Torn and lacerated
- (*b*) Subdural compression
- (*c*) Subdural sepsis

(6) Toilet: evacuation of: blood
- : loose lacerated material
- : foreign bodies
- : septic material

(7) Treatment of complications:
- : Intra-cranial. (*a*) Hæmorrhage:
  - (α) extradural
  - (β) subdural
- (*b*) Laceration
- (*c*) Compression
- (*d*) Sepsis

(8) Debridement

(9) Closure: with or without drainage

(B) Basal general deformation fractures:

(1) **Observative:**
- (*a*) Complete rest
- (*b*) Observation of complications
- (*c*) General nursing

(*d*) Prophylactic sedative and anti-tens treatment
(See under cerebral irritation)
(*e*) Urotropine; M & B 693
(2) Operative: trephining
Ind: (*a*) **Compression:**
: Local or gradually spreading
(*b*) ***Septic complications:***
: Requiring drainage
(*c*) **Sequelæ:**
: Late organic

After-treatment: of fracture skull
(1) **Observation for complications**
(2) **Complete rest with sedatives**
(3) **Prophylactic anti-tension treatment**
(4) **Prolonged restful convalescence**

(3) GUNSHOT WOUNDS OF THE SKULI

Compl: (A) Brain
(B) Vessels
(C) Skull
(D) Sepsis
(E) Retention of foreign bodies

Treat: Operate on every case within 24-36 hours:
(*a*) Preliminary X-Ray
(*b*) Excision of the wound
(*c*) Exposure of the bone
(*d*) Treatment of fracture:
(α) Trephine and enlarge the opening
(β) Trephine *en block*
(*e*) Dura mater: open if:
(α) Laceration
or (β) Subdural compression
and (γ) No sepsis outside dura
(*f*) Search for and removal of foreign body:
(α) Remove if superficial or septic
(β) Leave alone if deep and sterile
(*g*) Toilet
(*h*) Closure

Post-operative complications: after trephining for skull trauma
(A) **Immediate:**
(1) Continuance or appearance of **intra-cranial** complications:
(*a*) **Increased tension:**
(α) Irritation
(β) Compression
(*b*) **Sepsis:** Meningitis
Cerebritis
Abscess

(2) **Extra-cranial:** Sepsis
(3) **Chest complications**

(B) **Intermediate:**

(1) **Chronic or recurrent compression:**
Cause: Chronic cerebral œdema
Clinic: Cerebral irritation syndrome

(2) **Chronic sepsis:**
(*a*) **Intra-cranial:** Hernia cerebri
(*b*) **Cranial:** Necrosis

(C) **Late:**

(1) **Organic** sequelæ: traumatic epilepsy
(2) Traumatic **neuroses**

Special features of fracture skull in children. (Med. Ann. 1940)

Etio: Age: 5–10 years

Clinical pts: (1) Relatively benign, though symptoms appear severe
(2) Rapid and unexpected recovery
(3) Absence of unpleasant sequelæ
(4) Great discrepancy between fracture and clinical signs
(5) No slowing of the pulse in compression
(6) Safety-valve hæmatoma

Indications for operation:

(1) Open fractures
(2) Gross local neurological sign } + rapid pulse
(3) Coma persisting for 36–48 hours }

(III) INFECTION OF THE CRANIUM:

(1) ACUTE SUPPURATIVE PERICRANITIS:

Etio: (*a*) Infected scalp wound
(*b*) Suppurating cephal-hæmatoma

Clinic: (*a*) Acute inflammatory swelling
↓ (*b*) Suppuration
↓ (*c*) Ulceration: exposing **dead-white bone**

Compl: (*a*) Necrosis
(*b*) Emissary vein thrombosis → sinus thrombosis
(*c*) Intra-cranial sepsis

Treat: Incision and drainage

(2) ACUTE OSTEOMYELITIS OF THE CRANIUM:

Etio: (*a*) Infected scalp wounds
(*b*) Septic open fractures
(*c*) Extension from local septic focus:
: Sinusitis
: Mastoiditis
: Extra-dural abscess
(*d*) Pyæmic

Path : Inflammation of the diploe and outer table, inner table being comparatively healthy

Clinic : (*a*) Presence of or history of **etiology**
(*b*) **Local :** Signs of inflammation
(*c*) **General :** Signs of sepsis
(*d*) **Intra-cranial :** Signs of tension and sepsis

Compl : **Intra-cranial sepsis :**
(*a*) Sinus thrombo-phlebitis
(*b*) Extra-dural abscess
(*c*) Meningitis
(*d*) Subdural abscess
(*e*) Cerebritis and cerebral abscess

Treat : (1) **Excision :** In toto of the affected bone
(2) **Adson operation :** (Med. Annual, 1940)
: **Wide removal** of the outer table and the diploe only, by nibbling through small burr holes, **upto but not through the inner table**

(3) CHRONIC OSTEOMYELITIS OF THE CRANIUM :

(A) **Septic :**

Etio : (*a*) Sequela of acute osteomyelitis
(*b*) Sequela of extra-cranial infection
(*c*) Sequela of intra-cranial infection

Clinic : **Bare dead bone** exposed in the base of a chronic septic ulcer

Treat : (1) Removal of sequestrum after separation
(2) Excision of outer table and diploe :
: In extra-cranial infections
(3) Excision of the whole affected bone & drainage
: In intra-cranial infections

(B) **Syphilis :**

Path : Diffuse gummatous osteo-periostitis

Clinic : (*a*) Marked bony overgrowth
(*b*) **Silent necrosis :**
: Very slow separation of avascular sequestra

Treat : (*a*) Anti-syphilitic treatment
↓ (*b*) Excision
or (*c*) Removal of sequestrum after separation

(C) **Tuberculosis :**

Path : (*a*) Chronic periostitis } + cold abscesses on either surfaces
(*b*) Chronic osteomyelitis }

Clinic : (*a*) [illegible]
↓ (*b*) [illegible]
↓ (*c*) [illegible]

Treat : Excision of the affected bone

(IV) CRANIAL TUMOURS:

(See also under respective tumours)

(1) INNOCENT CRANIAL TUMOURS:

(A) **Lipoma:**
(B) **Fibroma:**

Path: (*a*) Periosteal
(*b*) Sometimes encysted
(*c*) Absorption of underlying bone

Clinic Pseudo-cystic if encysted

Treat: Excision

(C) **Ivory osteoma:**

Sites. (1) Vault:
(*a*) Outer surface
(*b*) Inner surface
(2) Air sinuses
(3) External auditory meatus

Clinic: (1) Swelling
(2) Pressure symptoms

(2) MALIGNANT CRANIAL TUMOURS:

(A) **Primary: Sarcoma:**

(*a*) Periosteal: bun-shaped tumour
slow or rapid
pulsatile or bony
(*b*) Central: myelo-sarcoma

(B) **Secondary:**

(1) **Sarcoma:**
Primaries. (*a*) Juvenile kidney sarcoma:
: Multiple, round, soft nodules
(*b*) Bony sarcoma elsewhere
(*c*) Meningioma

(2) **Carcinoma:**
Primaries. (1) Breast
(2) Bronchus
(3) Kidney
(4) Prostate
(5) Stomach
(6) Thyroid

Clinic: (1) **Localized pain** in a bone
(2) **Swelling:**
(*a*) Vascular:
(α) Thyroid } secondaries
(β) Kidney }
(*b*) *Bony*
(3) **X-Ray: Erosion without new bone formation**

Treat: (1) Deep X-Ray therapy
(2) Radium

(V) ACQUIRED DEFECTS OF THE CRANIUM:

(1) CRANIOTABES:
: Localised thinning of the cranium due to a metabolic disease: (*a*) Rickets
(*b*) Osteomalacia
(*c*) Syphilis

(2) PRESSURE ABSORPTION: Secondary to:
(*a*) Cysts or aneurysms
(*b*) Benign growths

(3) EROSION:
(A) Septic: acute and chronic osteomyelitis
(B) Malignant growths

(4) OPERATIVE: **Trephine defects:**
Sequelæ: (*a*) Tender scar
(*b*) Intra-cranial consciousness
(*c*) Headache
(*d*) Epilepsy
(*e*) Liability to trauma
(*f*) Neuroses
Treat: (1) Celluloid graft
(2) Bone-graft
(3) Protective cap or helmet

(VI) IMPORTANT POINTS

(1) Motor car accidents are becoming the chief etiological factor in head injuries

(2) Septic complications of head wounds or sepsis:
(A) Extra-cranial:
(*a*) Local abscess or sloughing
(*b*) Subcutaneous cellulitis
(*c*) Sub-epicranial abscess or cellulitis
(*d*) Sub-pericranial suppuration
(B) Cranial:
(*a*) Acute osteomyelitis
(*b*) Chronic osteomyelitis with necrosis
(C) Intra-cranial:
(*a*) Extra-dural abscess
(*b*) Sinus-phlebitis and thrombosis
(*c*) Meningitis
(*d*) Subdural abscess
(*e*) Brain abscess or cerebritis
(*f*) Hernia cerebri

(3) *The whole head should be shaved in every case of head inju*

(4) Fluctuating and pseudo-fluctuating swellings of the scalp:

(A) Fluctuating:

- (*a*) Sebaceous cyst
- (*b*) Dermoid cyst
- (*c*) Meningocele: congenital or traumatic
- (*d*) Hæmatoma
- (*e*) Abscess: acute or cold
- (*f*) Sinus pericranii

(B) Pseudo-fluctuating:

- (*a*) Lipoma: encysted
- (*b*) Fibroma: encysted
- (*c*) *Angioma: cavernous*

(5) Local swelling on the cranium:

(1) Inflammatory:

(A) Acute: (*a*) Acute pericranitis
(*b*) Acute osteomyelitis

(B) Chronic: chronic osteomyelitis.
(α) Sepsis
(β) Syphilis
(γ) T. B.
(δ) Typhoid

(2) Pseudo-inflammatory: vascular

- (A) Traumatic: cephal-hæmatoma
- (B) Benign: angioma
- (C) Malignancy: (*a*) Sarcoma
(*b*) Secondary carcinoma

(3) Non-inflammatory:

- (A) Traumatic: old ossified cephal-hæmatoma
- (B) Benign growths: periosteal lipoma
fibroma
ivory osteoma
- (C) Some secondary malignant growths

(6) Complicating features of fracture skull:

- (1) *Infection*
- (2) Pressure: intra-cranial
- (3) Associated injury to central nervous system
- (4) Sequelæ: (*a*) Non-organic or functional
(*b*) Organic: (α) pressure
(β) fibrosis
(γ) loss of protection

) Two types of cranial fractures call for immediate interference

- (*a*) Depressed fractures
- (*b*) Compound fractures

(8) Three important factors in basal fractures:
 (a) Indirectly compound
 (b) Cranial nerve injuries
 (c) Observative treatment

(9) Nerve palsies in cranial injuries may be:
 (a) Immediate: laceration
 (b) Intermediate: hæmorrhage or œdema in the sheath
 (c) Late: fibrosis

(10) Presence or absence of fracture skull is not important in respect of sequelæ and complications of head injuries.

(11) Anosmia is not necessarily a sign of fracture of anterior fossa, but rather of injury to the under surface of frontal lobes and olfactory tracts.

(12) Fracture of the skull is certainly not the criterion to the extent of cerebral damage sustained. In the absence of fracture, cerebral injury may be considerable.

(13) Patients with fracture skull who survive, are returned to their full working capacity more quickly than patients with head injury of the same magnitude but without fracture.

(14) Common clinical signs of post-traumatic neuroses:
 (a) Headache
 (b) Giddiness
 (c) Mental instability
 (d) Inability to concentrate
 (e) Homicidal or suicidal tendencies
 (f) Lack of emotional control
 (g) Change of temperament
 (h) Moral turpitude

(15) General deformation fractures:
 : Observative treatment with interference only when indicated.

(16) Local deformation fractures: open and depressed:
 : Early interference

(17) Fracture skull and its intra-cranial complications are separate entities, each of which may have separate independent existence without the presence of the other; their relations may be compared with those of acute appendicitis and pelvic abscess.

(18) Treatment of fracture base of the skull is maintenance of asepsis by masterly inactivity with no pluggings or washings.

(19) In children, local fracture of the vault may be simple and should be elevated if there is depression even though there are no symptoms.

(20) In all operations on the cranium, try to keep the dura intact, as far as and if, possible.

(21) Type of acute osteomyelitis common in the long bones of the limb—a metaphysitis—is not found in the skull.

(22) Bones developed from membranes have poor regenerative power

(23) Localised persistent pain or a localised swelling on the skull in old age:
? Secondary malignancy.

(24) Intra-cranial complications of fracture skull:
- (1) Immediate: traumatic
  - (*a*) Concussion
  - (*b*) Acute hæmorrhagic compression
- (2) Intermediate: inflammatory
  - (*a*) Chronic or delayed compression:
    - (α) Hæmorrhage
    - (β) Œdema of brain
  - (*b*) Intra-cranial sepsis
- (3) Late: sequelæ
  - (*a*) Organic: fibrosis
  - (*b*) Functional.

CHAPTER II

THE FACE

(I) CONGENITAL ABNORMALITIES OF THE FACE:

Embryology: Stomodæum is surrounded by following processes:

- (a) Fronto-mesial process
- (b) Mesio-nasal or globular processes
- (c) Lateral nasal processes
- (d) Maxillary extensions of mandibular
- (e) Mandibular processes

Pathology: **Failure of union or excessive union of the maxillary process with other processes** is the most common cause of facial malformations.

Path. varieties:

(A) ABNORMAL UNION BETWEEN PROCESSES:

(1) **Macrostoma**: Failure of union between maxillary and mandibular

(2) **Microstoma**: Excessive fusion between maxillary and mandibular

(3) **Hare-lip**:
: Failure of union between maxillary and globular (see under lip)

(4) **Cleft palate**: Failure of union between:
(a) Maxillary and globular
+ (b) Palatal processes of maxillary (see under palate)

(5) **Facial cleft**:
: Failure of union between maxillary and lateral nasal + globular

(6) **Mandibular cleft**:
: Failure of union between mandibular processes

(B) INCLUSION ALONG THE FUSION LINES:

(1) **Dermoid cyst**: (a) Outer angle of the orbit
(b) Root of the nose

(2) **Meningocele**: Root of the nose

(C) BRANCHIAL CLEFT ANOMALY:

(1) Pre-auricular fistula
(2) Pre-auricular dermoid
(3) Auricular appendages
} Anomalies of the posterior end of first branchial cleft

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} Anomalies of the posterior end of first branchial cleft

(D) CONGENITAL NEW GROWTHS:
: **Nævi and moles**

(E) MISCELLANEOUS:
(1) **Anophthalmia**
(2) **Nasal atresia**
(3) **Fistula of the lip:** (see under lip)

Etio: (1) **Heredity:** 50%
(2) Race: Negroes: rare
Hebrews: less
Whites: common

Clinic: Facial cleft: Upper lip
↓ Middle of lower eyelid
↓ Outer canthus
↓ Temporal region

(II) TRAUMA OF THE FACE:

(1) CONTUSIONS OF THE FACE:
(A) **Orbital contusion:** Black eye (see under Orbit)
(B) **Nasal contusion:**

Diff. diag: From nasal fracture

(C) **Mandibular contusion:**
(1) Subcutaneous: movable over the bone
(2) Subperiosteal: (*a*) non-mobile
(*b*) very painful

Diff. diag: From fracture jaw

Compl: (*a*) Sepsis: osteomyelitis jaw
(*b*) Fibrosis → ossification
(*c*) Associated fracture

Treat: Cold applications

(2) PENETRATING WOUNDS OF THE FACE:

Etio: Stabs
Glass wounds

Compl: (1) Sepsis with cellulitis or suppuration
(2) Scars
(3) Injury to: (*a*) Salivary duct
(*b*) Facial nerve
(*c*) Nose and lip

Treat: *Principles:*
(*a*) Local analgesia: novocain + adrenalin
(*b*) Eyeless needles for sutures
(*c*) Subdermal horse-hair sutures
(*d*) Careful eversion of skin margins
(*e*) Immediate plastic repair of lost tissues
(*f*) Attention to Stenson duct and facial nerve

(g) Attention to fracture deformities:
  (α) Nasal
  (β) Malar
  (γ) Zygomatic
  (δ) Mandibular
(h) Early removal of sutures: fifth day

(3) FRACTURES OF THE FACIAL BONES:
(See under bones)

Sites: (a) Nose
(b) Orbit
(c) Maxilla
(d) Malar
(e) Zygomatic arch
(f) Mandible

Sp. compl: (1) Deformity
(2) Emphysema: fracture air sinuses
(3) Sepsis

(4) DISLOCATION OF THE JAW: (See under joints)

(III) ACUTE INFECTIONS OF THE FACE:

(1) BOILS: (See under skin)

Special compl: (a) Facial cellulitis
(b) Regional lymphadenitis
(c) **Cavernous sinus thrombosis**
(d) Septicæmia or pyæmia

Treat: (A) Local treatment:
  (a) Warm compresses
  (b) Mag. sulph-glycerine: after bursting
  (c) **No operative interference**
(B) Specific treatment:
  (a) Sulphanilamide
  (b) **Tin and manganese**
  (c) Vaccines
(C) Special treatment:
  : **Prophylactic ligature of angular vein**

(2) CARBUNCLE: (See under lip)

(3) ERYSIPELAS: (See under skin)

Special compl: (1) Cavernous sinus thrombosis
(2) Recurrence → lymphatic œdema

(4) CELLULITIS: (See under skin)

Etiology: Local septic focus

Clinic: Œdematous, brawny, spreading swelling

Compl: (a) **Cavernous sinus thrombosis**
(b) Cervical cellulitis → **œdema glottis**
(c) Sloughing

Treat: (1) General and specific
(2) Incisions parallel to the nerve branches
↓ Mag. sulph-glycerine packs
(3) **Prophylactic angular vein ligature**
Ind: (*a*) Unilateral oedema of inner canthus
+ (*b*) High temperature
Tech: (1) Proper: (*a*) Hypnotic 20 minutes before
(*b*) Castor oil into the eye
(2) Anaesth: Novocain infiltration
(3) Steps: (*a*) Incision over the line of the vein
(*b*) Muscle tissue split
(*c*) Divide angular vein between ligatures
(*d*) Skin sutures
(*e*) *Collodion dressings*

5) ANTHRAX: (See under anthrax)
Clinic: (1) **Local**: Pimple
↓ Papule
↓ Pustule
↓ Black slough
(2) **Regional**: Acute inflammatory œdema
(3) **General**: Toxæmia or septicæmia
(4) **Occupation**: Contact with animal carcass, shaving brush
Compl: (*a*) Cavernous sinus thrombosis
(*b*) Cervical cellulitis with œdema glottis
(*c*) Anthrax septicæmia
Treat: (1) Sclavo's serum
(2) Sulphanilamide group
(3) *Excision*

(IV) ULCERS OF THE FACE:

(1) NON-SPECIFIC:
(*a*) Trauma
(*b*) Burns and scalds
(*c*) Irritant dermatitis and excoriations
(*d*) Ulcerating sebaceous cyst
(*e*)

(β) Rapid appearance in crops

(2) SPECIFIC:
(A) **T. B.**:
(*a*) **Scrofulo-dermia**: (See under skin)
(*b*) **Lupus**: (See under skin)
(B) **Syphilis**:
(*a*) **Extra-genital chancre**: Lip, eyelid
(α) Swelling with erosion
or (β) Ulcerative
+ (γ) Massive enlargement of lymph glands

(b) **Tertiary:**
(α) Gummatous
(β) Lupoid

(C) **Actinomycosis**

(D) **Tropical sore**

(E) **Leprosy**

(3) NEO-PLASTIC:

(A) **Rodent:** (See under skin)

Diff. diag:

Signs	*Rodent*	*Lupus*
Extension	Superficial+deep	**Superficial only**
Base	No epithelisation	Epithelisation
Margins	**Beaded**	Non-indurated
Glands	Not enlarged	Enlarged

(B) **Epitheliomatous:**
(α) Flat
(β) Fissured
(γ) Excavated
(δ) Polypoid

(C) **Melanoma**

(D) **Sarcoma**

(V) NEOPLASMS OF THE FACE:

(See also under respective tumours)

(1) HÆMANGIOMA: Nævi

Varieties: (a) Capillary: anywhere
(b) Compact } cheek, forehead
(c) Cavernous } cheek, forehead
(d) Plexiform: orbital, temporal

Treat: (1) Carbon-dioxide snow
(2) **Radium**
(3) Electro-cautery
(4) Excision with plastic surgery

(2) MELANOMA:

Clinic: Pigmented or hairy moles

Compl: (a) Disfigurement
(b) Malignant degeneration

Treat: Excision with plastic surgery

(3) NEURO-FIBROMA:

Varieties: (a) Molluscum fibrosum: anywhere
(b) Plexiform neuro-fibroma: orbit, ear

(4) CARCINOMA OF THE FACE:

(A) **Squamous** celled:

Etio: Pre-existing focus of chronic irritation:
- (*a*) Lupus
- (*b*) Rodent ulcer
- (*c*) Paraffin products: shale oil
  mule spinners

(B) **Secondary**: Involvement in deeper carcinoma from jaws, parotid, mouth, cheek

(5) BASAL CELLED OR RODENT ULCER:

Compl: (1) Secondary hæmorrhage
- (2) Sepsis
- (3) Hideous deformities
- (4) Epitheliomatous change
- (5) Aspiration pneumonia

(VI) PARALYSIS OF THE FACE: (See facial nerve)

Etio: (1) **Bell's palsy**
- (2) **Head injuries or apoplexy**
- (3) **Ear** affections:
  - (*a*) Otitis media
  - (*b*) Mastoid operation
- (4) **Parotid** affections:
  - (*a*) Carcinoma parotid
  - (*b*) Parotid incisions

Clinic: Asymmetry of the face

Treat: (1) **Conservative**
- (2) **Operative**:
  - (A) **Duel-ballance**: Nerve inlay
    - Tech: Introduction of fresh or degenerated nerve graft into the gap made by removal of a piece of facial nerve in the aqueduct
    - Ind: Good galvanic response
  - (*B*) ***Gillies**: Fascia lata operation:*
    - : Subcutaneous insertion of fascia lata to sling up the paralysed muscles

(B) THE ORBIT

(I) CONGENITAL ABNORMALITIES:

- (1) Anophthalmos
- (2) Misplaced eyes: anencephalic monsters

(II) TRAUMA TO THE ORBIT:

(1) *SUBCUTANEOUS CONTUSION*: **Black eye**

Etio: Direct blow

Clinic : (*a*) **Contusion not restricted by orbital margin**
(*b*) **Sub-conjunctival hæmorrhage** absent or **shows posterior margin**
(*c*) Lids more affected than conjunctivæ
(*d*) No proptosis
(*e*) Skin abrasions

Diff. diag : From orbital hæmatoma
Treat : Cold applications

(2) FRACTURE ORBIT : **Orbital hæmatoma**

Etio : (1) Fracture base of the skull
(2) Direct fracture orbit

Clinic : (*a*) **Contusion limited by orbital margin**
(*b*) **Sub-conjunctival hæmorrhage** marked and **does not show posterior limits**
(c) Lids not affected or less affected
(*d*) Proptosis
(*e*) Skin not affected

(3) PENETRATING INJURIES OF THE ORBIT :

Compl : (1) Trauma to the eye ball
↓ Sympathetic ophthalmia
(2) Panophthalmitis
(3) Orbital cellulitis → cavernous thrombosis
(4) Fracture orbit

(III) INFECTIONS OF THE ORBIT :

(1) STYE :

Def : Acute inflammation of the hair follicle and gland
Path : Staphylococcal infection
Clinic : Puffy localised swelling of the eyelid
↓ Yellow local spot
Treat : (1) Fomentations
(2) As in boil (see under skin)

(2) ORBITAL CELLULITIS :

Etio : (1) Penetrating septic injuries
(2) Secondary to :
(*a*) External infections : face
(*b*) Internal infections : intra-cranial

Clinic : (1) Local : acute inflammation
(*a*) Proptosis
(*b*) Chemosis
(*c*) Œdema of the eyelids
(2) General : constitutional signs

Compl : (1) **Cavernous sinus thrombosis**
(2) **Panophthalmitis**

Treat : Incision and drainage :
: Along lower orbital margin

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Etio: Direct blow

(4) MEDIAN NASAL ROOT CYSTS:

- (A) **Dermoid**
- (B) **Meningocele:**
  - (*a*) Impulse
  - (*b*) Empties on pressure
- (C) **Sinus Pericranii:**
  - (*a*) Vertical midline
  - (*b*) Impulse
  - (*c*) Visible than palpable
  - (*d*) Palpable linear bony defect
- (D) **Sebaceous cyst**
- (E) **Mucocele of frontal sinus**

(VI) EXOPHTHALMOS:

(A) BILATERAL:

- (1) **Toxic goitre:**
  - (*a*) Exophthalmos
  - (*b*) Goitre
  - (*c*) Nerve signs: tremors
  - (*d*) Heart signs: tachycardia
  - (*e*) *Metabolism*: *increased*
- (2) **Cavernous sinus thrombosis:**
  - (*a*) Septic focus on the face
  - (*b*) Acute general sepsis
  - (*c*) Acute local signs:
    - (α) Acute œdema of the orbit
    - (β) Chemosis
    - (γ) Proptosis
    - (δ) Ophthalmoplegia
  - (*d*) Sequence: unilateral → bilateral

(B) UNILATERAL:

- (1) **Orbital hæmatoma**
- (2) **Orbital cellulitis**
- (3) **Orbital** ***periostitis*****:** T. B. and *syphilis*
- (4) **Gumma**
- (5) **Tumours of the orbit:** Osteoma; sarcoma; xanthomatosis
- (6) ***Tumours of the eyeball:*** (*a*) ***Glioma in children***
  (*b*) **Melanoma in adults**
- (7) **Aneurysms:**
  - (A) **Arterio-venous aneurysm:**
    Etio: Fracture skull base
    Path: Int. carotid art. with cavernous sinus
    Clinic: (*a*) **Pulsating exophthalmos**
    (*b*) Audible and subjective bruit
    (*c*) Effect of proximal pressure
  - (B) **Aneurysm of ophthalmic artery**

(3) ORBITAL PERIOSTITIS OR OSTEOMYELITIS:

(A) **Septic**

(B) **Tuberculosis:** Cold abscesses

(C) **Syphilitic:** Gumma: therapeutic test
Kahn reaction

(IV) TUMOURS OF THE ORBIT:

(See also under respective tumours)

Varieties:

(1) **Osteoma:** Ivory

(2) **Carcinoma:** Lacrymal

(3) **Glioma of the eye:**

Etio: Child about 4 years
Path: Highly malignant
Clinic: Bilateral
Rapid growth
Blindness
Compl: Ulceration → fungation → hæmorrhage

(4) **Melanoma:** Uveal

Etio: Adult: 40-60 years
Path: Malignant
Secondaries in liver

Clinical features of orbital growths:

(A) Local: (1) Proptosis
(2) Keratitis
(3) Chemosis
(4) Œdema of the lids
(5) Visual disturbances

(B) Metastases: Liver: (in uveal melanoma)

(V) CYSTS ROUND ABOUT THE ORBIT:

(1) EXTERNAL ANGULAR DERMOID:

Clinic: Cystic swelling at the supero-ext. angle of the orbit
Treat: Excision

(2) MEIBOMIAN CYST:

Def: Staphylococcal infection of Meibomian gland
Clinic: Local swelling in the lid, visible or palpable through skin
Treat: (a) Fomentations
↓ (b) Incision on the conjunctival aspect
↓ (c) Scraping: if necessary

(3) LACHRYMAL MUCOCELE:

Path: Obstruction with infection of lachrymal sac.
Treat: Lachrymal douches → Excision

(4) Treatment of protruding premaxilla :
  (a) Rely on muscular pressure of repaired lip
  or (b) Rectification after fracture

(5) **Paring the cleft margins :**
  (a) Careful measurements
  (b) Free excision of median lip element
  (c) Preservation of lateral lip element
  (d) Preservation of all available skin

(6) **Reconstruction of nasal floor :**
  Veau :
  (a) Separate deep surface of prelabium
  (b) Vomerine flap
  (c) Flap from the nasal side of maxillary palatal process
  (d) Skin flap from inner lining of nostril

(7) **Suture :**
  (a) **Independent closure of oral sphincter :**
    : By muco-muscular mattress sutures
    : Chromic catgut 000.
  (b) Skin sutures : fine silkworm gut
  (c) **First suture at skin-vermilion border with careful alinement**
  (d) **Leave slight projection** at the site of junction of the lip elements
  (e) Get vertical scar parallel to columella

After-treat : (1) **Rubber tubes in nostrils :** In infants
(2) Collodion dressings
\+ (3) Elastoplast strip
or (4) Logan's bow
(5) Sutures out by 5th day
(6) Mouth gargles
(7) **Avoid tension on sutures**

Post. compl : (1) **Sudden asphyxia**
(2) Broncho-pneumonia
(3) **Sloughing of soft tissues**
(4) Injury to incisor tooth bud

Sequelæ : (5) Flat upper lip : if premaxilla is removed
(6) **Notching of the lip**
(7) Spreading of the lip
(8) **Flat nose**

(C) THE LIP

(I) CONGENITAL AFFECTIONS OF THE LIP:

(1) HARE-LIP:

Etio: (*a*) Heredity
(*b*) Boys
(*c*) Left side

Path:

Varieties: (A) **Median:** Rare
(*a*) Cleft between two globular processes
(*b*) Absence of premaxilla

(B) **Unilateral:**
Failure of union between:
(*a*) Globular process
and (*b*) *Maxillary process*

(C) **Bilateral:** [as in (B) on both sides]

Degrees: (1) Fistula of the lip: rare
(2) Notched lip: incomplete
(3) **Complete hare-lip**
(4) Hare-lip + nasal extension + premax. notch
(5) **Hare-lip + varying degrees of cleft palate**

Types. (1) Pre-alveolar: simple: lip only
(2) Alveolar: total: lip + alveolus

Clinic: (1) Deformity:
(*a*) Lip: cleft
(*b*) Premaxilla: forward inclination
(*c*) Nose: flat
(2) Inability to suckle

Compl: (1) Cleft palate
(2) Other congenital deformities

Treat: Operative repair: Cheilo-plasty

(A) Pre-operative: apposition by adhesive strapping

(B) **Time:**
(1) **Six weeks to twelve weeks**
(2) After healing: if associated cleft palate is operated upon early
\+ (3) **Very good general health**

(C) **Operative principles:**
(1) Skilled anæsthesia
(2) *Methylene blue tattoo of guide points*
(3) **Free liberation of soft tissues off the bones:**
(*a*) Ala of the nose
(*b*) Upto infra-orbital foramen

(2) CRACKS OF THE LIP:

Etio: (*a*) Cold weather
(*b*) Syphilis:
(1) Congenital
(2) Primary chancre
(3) Secondary fissures: angle of the mouth
(4) Tertiary: gummatous

Clinic: Painful raw breaches in surface

Treat: (1) Emollients: hazeline snow
(2) Strapping
(3) Excision
(4) Treatment of etiology

(3) BOIL AND CARBUNCLE OF THE LIP:
(See under skin)

Path: Staphylococcal infective inflammatory sloughing of the subcutaneous and submucous tissues of the lip

Clinic: **Acute inflammatory œdema with multiple yellow points or openings**

Compl: (1) **Facial cellulitis**
(2) Regional lymphadenitis
(3) **Cavernous thrombo-phlebitis**
(4) Septicæmia or pyæmia
(5) Cancrum oris

Treat: (1) **Conservative:**
: Fomentations
↓ Mag. sulph. glycerine pack
+ Mouth gargles
(2) General and specific
(3) Special:
(*a*) **Prophylactic ligature of angular vein**
(*b*) **Local operative interference contra-indicated**

(4) SYPHILIS OF THE LIP:

(A) **Primary: chancre**

Etio: Most common extra-genital

Clinic: (*a*) Indurative: induration
(*b*) Hypertrophic: warty
(*c*) Erosive: fissure
(*d*) Ulcerative: ulcer
(1) **Painless indolent focus** with indurative œdema
(2) Indolent massive enlargement of submaxillary or submental lymph glands

(B) **Secondary**: (*a*) Mucous patches
(*b*) Fissures: angles of the mouth
(*c*) Ulcers

Individual operations with indications:

(A) **Unilateral:**

(1) **Nelaton:** Slight notch
(2) **Rose:** Symmetrical sides of the cleft
(3) [illegible] f the cleft
(4) [illegible] the cleft
(5) [illegible]
: Unsymmetrical, large, deep cleft
(6) **Veau:** Implication of nasal floor

(B) **Bilateral:**

(1) **Rose:** Symmetrical sides of the cleft
(2) **Thompson:** Symmetrical sides of the cleft
(3) **Hagedorn:** Unsymmetrical wide cleft
(4) **Veau:** Two stage operation at the interval of three months

(C) **Accessory operations:**

(1) **Nelaton's diamond operation:**
Ind: Post-operative notch
(2) **Gillies cupid bow operation:**
Ind: Irregular vermilion border
(3) **Nasal plastic repair:**
Ind: Nasal deformities
(4) **Gillies epithelial inlay:**
Ind: Flat lip

(2) FISTULA OF THE LIP:

Etio: Rare
Path: Reversion to mucous glands of the shark
Clinic: Two blind mucous pits:
: Symmetrical on either side of midline
: Opposite lateral incisors
Compl: Association with bilateral cleft-lip

(II) TRAUMA OF THE LIPS:

(1) **Bites**
(2) **Lacerations**
(3) **Amputations**

Points: (1) Control hæmorrhage by finger compression on each side of the wound
(2) Secure coronary artery on both sides
(3) Pass stitch at the junc. of red margin and skin
(4) Catgut sutures for mucous membrane
(5) Silkworm or horsehair sutures for skin

(III) INFLAMMATIONS OF THE LIPS:

(1) TRAUMATIC

Diff. diag : Any other : Chronic inflammation / Chronic ulceration / New growth } of the lip

Treat : (1) **Radium :**

(A) Primary : Interstitial irradiation
: Needles at intervals of 1 to 1.5 cms. fixed to the deep aspect of dental wax cover with a shield of 1 mm. lead, worn :
(*a*) Continuously for 8-10 days
or (*b*) 12 hours a day for 3 weeks
(B) Glands : Columbia paste collar

(2) **Excision :**

Methods : (1) Surgical
(2) Electro-thermal

Anæsth : (1) General
(2) Local :
: Intra-oral procaine infiltration of :
(*a*) Inf. dental foramen
(*b*) Infra-orbital foramen

Tech :

(A) Primary with a margin of healthy tissues
(B) Glands :
Contraind :
(*a*) Early non-palpable glands
(*b*) Late stage :
(1) Fungating
(2) Wide infiltration
(3) Below the level of thyroid cartilage
(4) Above the level of the angle of the jaw

Tech : (*a*) Two stage / (*b*) One stage } glands first

After-treat : Radium collar :
: One month after healing

IMPORTANT POINTS

(1) Heredity plays an important part in the production of congenital malformations of the face and the mouth.
(2) Four most common congenital irregularities of the face are :
(*a*) Hare-lip
(*b*) Cleft palate
(*c*) Orbital dermoid
(*d*) Congenital angioma or melanoma.
(3) In trauma to the face, make sure about the absence of :
(*a*) Fracture underlying a contusion
(*b*) Trauma to facial nerve
(*c*) Trauma to Stenson's duct.

(C) **Tertiary**: (*a*) Gummatous infiltration
(*b*) Gummatous nodule
(*c*) Gummatous ulcer

(D) **Congenital**: Cracks at the angle of the mouth

(IV) GROWTHS ON THE LIP:

(See also under respective tumours)

(A) MUCOUS CYSTS:

Path: Retention cyst of mucous gland
Clinic: Bluish, shiny, thin-walled, small
Treat: Excision

(B) CONNECTIVE TISSUE GROWTHS:

(1) **Hæmangioma**
(2) **Lymphangioma**: Cavernous
: Lymphangiomatous macrocheilia
(3) **Neuro-fibroma**: Plexiform
: Neuro-fibromatous macrocheilia

(C) EPITHELIAL TUMOURS:

(1) **Papilloma**: Etiology of carcinoma
(2) **Carcinoma**: Countryman's lip

Etio: (*a*) Lower lip of old males
(*b*) Precancerous states:
(1) Chronic burns: smoker's patch
(2) Keratoses
(3) Leucoplakia
(4) Chronic fissures and ulcers
(5) Papillomata

Path: (1) Squamous celled carcinoma
(2) Spread:
(*a*) Local: (α) mucous surface
(β) lip and face muscles
(*b*) Regional: cheek, gums, alveolus
(*c*) Distant: lymph glands:
(1) Submental
(2) Submaxillary
(3) Upper deep cervical
(4) Lower cervical

Clinic: (1) Local: (*a*) Indurative
(*b*) Papillary or warty
(*c*) Fissure
(*d*) Ulcerative
With: (*a*) Deep induration
(*b*) Infiltration of surroundings
(*c*) Eversion of margins
(*d*) Friability
(*e*) Rapid growth
(2) Enlarged lymph glands

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(4) The dangerous area of the face:
: Triangle from the angles of the mouth to the root of the nose.

(5) The dangerous primary foci of the face:
(a) Furuncles
(b) Carbuncles
(c) Pimples.

(6) The most dangerous sequela of face sepsis:
: Cavernous sinus thrombosis.

(7) *In every septic lesion of the face:*
: Lay persons must learn to keep their hands off their faces and surgeons must learn to keep their hands off their patients' faces.

(8) Angular and facial veins communicate with cavernous sinus via:
(a) Directly: (α) Naso-frontal vein
↓ (β) Superior ophthalmic vein
(b) Indirectly: (α) Deep facial vein
↓ (β) Pterygoid plexus.

(9) Special ulcers of the face are:
(a) Lupus: never erodes bones
(b) Rodent: goes deep.

(10) A cystic tumour situated at the supero-external angle of the orbit is a dermoid unless proved otherwise.

(11) *Complications of a scar of the eyelid:*
(a) Ectropion
(b) Entropion

(12) Repair of even the simplest looking hare-lip is a major operation in a baby less than six months old.

(13) Real test of a successful operation for hare-lip is not the perfection of the scar but the symmetry of the face.

(14) Most important points in hare-lip surgery are:
(1) Free liberation of soft tissues
(2) Independent closure of oral sphincter
(3) Careful alinement of vermilion border
(4) Slight projection at the junction

(15) Union of the lip-cleft is sufficient in the majority of cases to induce a falling in of the alveolar projection and an approximation of the alveolar cleft.

(16) Avoid interference with the premaxilla; the bony parts remodel themselves if soft tissues are accurately apposed.

(17) In bilateral pre-alveolar lip-clefts, prolabial skin should not be incorporated in the whole length of the lip.

(18) Beware of sudden asphyxia in an infant operated upon for hare-lip repair; rubber airways with constant watch are essential.

(19) Surgery for early and too late cancer of the lip should be replaced by radiotherapy.

(20) Consensus of opinion is in favour of radiotherapy for early cancer of the lip and of avoidance of mutilating operations. Dissection of glands should only be undertaken, if they are palpable, enlarged and mobile.

(21) Recurrence after efficient treatment of cancer lip is unlikely after one year.

(22) Any indolent focus on the lip:
? Chancre.

(23) Beware of a man with a glass eye and an enlarged liver:
? Uveal melanoma.

(24) Carcinoma of the angle of the mouth is very malignant.

CHAPTER III

THE EAR

(I) EXTERNAL AUDITORY MEATUS:

(1) EXOSTOSES: (Ivory type)

(A) Single, pedunculated:
: Excision

(B) Multiple, sessile:
: Leave alone

(2) FOREIGN BODIES:

Clinic: (1) History or no history
(2) Painful and swollen ear
(3) Discharge
(4) Inspection

Treat: (A) Soft body that can swell:
: Remove immediately

(B) Hard body with no acute symptoms:
: Remove at leisure

(C) Living insects:
: Instil few drops of 5% cocain

Tech: (1) Forceps: useless and dangerous

(2) **Syringing:**

Ind: (*a*) Loose small body
(*b*) Soft breakable body

Contraind: (*a*) Impacted hard body
(*b*) Swellable body

(3) Tube with **suction apparatus**

(4) **Right-angled hook or curette**

(5) Open operation:

(*a*) Incision in post-aural furrow
(*b*) Detachment of soft from bony meatus
(*c*) Extraction of foreign body
(*d*) Suture

(3) FURUNCLE OF THE MEATUS:

Def: Inflammation of pilo-sebaceous gland of the cartilaginous meatus

Etio: (*a*) General lowered resistance
(*b*) Eczema of the meatus
(*c*) Septic discharge from the ear

Clinic: (1) **Unripe boil:**
: Acutely painful and tender œdematous swelling of the meatus
(2) **Meatal abscess**
(3) **Post-auricular abscess:**
: Tenderness of pre-auricular or mastoid lymph gland

Diff. diag: (1) **Otitis media**
(2) **Mastoiditis**

Treat: (1) Stage of swelling and induration:
(A) Local:
(*a*) Vaseline gauze pack
(*b*) Glycerine icthyol pack
(*c*) Protection and heat to the ear
(B) General:
(*a*) Collosol manganese + stannoxyl
(*b*) Aspirin + phenacetin + codein
(C) Don'ts:
(*a*) Do not incise
(*b*) Do not syringe
(*c*) Do not use strong antiseptics
(2) Stage of meatal abscess:
: Meatal incision and drainage
(3) Stage of post-aural abscess:
: Post-aural incision and drainage

(II) MIDDLE EAR:

(1) ACUTE SUPPURATIVE OTITIS MEDIA:

Etio: (1) **Septic tonsils,** adenoids or pharynx
(2) Exanthemata
(3) Acute fevers

Path: Routes of infection:
(*a*) **Eustachian tube**
(*b*) External auditory meatus
(*c*) Internal auditory meatus
(*d*) Blood stream

Clinic: (1) **Acute otalgia**
(2) Deafness
(3) **Pyrexia:** High and variable
(4) Red bulging drum

Diff. diag: (1) Myringitis
(2) Otitis externa
(3) Herpes oticus

Treat: (1) **Conservative:**
Ind: (*a*) Subsiding attack
(*b*) No bulging of the dru

(c) Adequate perforation
(d) No marked toxæmia

(2) **Myringotomy :**

Ind : (a) Bulging drum
+(b) Acute toxæmia

Tech : (a) General anæsthesia
(b) Incise from below upwards

After-treat : (a) Dry dressings
(b) **No syringing or hydrogen peroxide**
(c) No tonsillectomy within 3 weeks

(2) CHRONIC SUPPURATIVE OTITIS MEDIA :

Etio : (1) Acute otitis media with imperfect drainage
(2) Primary chronic otitis : pharyngeal infection

Path : Osteitis of middle ear
Granulations
Chronic suppuration
Cholesteatoma

Clinic : (1) Chronic discharge through perforated tympanum
(2) Perforation, granulations, cholesteatomata

Treat : **Radical mastoid :**
(a) Exposure of antrum
(b) Removal of bridge between antrum and middle ear
(c) Toilet of middle ear
(d) Drainage

Ind : (a) Exacerbation of chronic otitis
(b) Intra-cranial invasion
(c) Labyrinthitis
(d) Presence of :
(1) Cholesteatomata
(2) Granulations
(3) Sinuses
(4) Caries
(5) Chronic discharge

Contraind : (a) Antero-inferior perforation
(b) Central perforation
(c) Useful hearing present

Pre-oper. treat : Removal of tonsils, adenoids etc.

Tech :
(1) Incision : as for Schwartze
(2) Detachment of soft meatus from bone
(3) Exposure of antrum and whole of mastoid
(4) Excision of post. bony wall of meatus

(5) Careful division of 'bridge'
(6) Scraping of middle ear:
(α) Malleus
(β) Incus
(γ) Tympanum
(7) Clear all overhanging margins
(8) Plastic operation on the meatus: by
(α) Enlargement of meatal opening
(β) Meato-chonchal flap
(γ) Skin graft
(9) Closure of post-aural incision
(10) Packing with ribbon gauze in oily flavine

After-treat: (a) Change outer dressing: 3rd day
(b) Change of pack: 10th day
(c) Syringing: 2nd week

Oper. compl: (1) **Injury to labyrinth**
(2) **Injury to stapes**
(3) Injury to carotid artery
(4) Injury to jugular bulb
(5) Injury to semicircular canals
(6) **Injury to facial nerve**
(7) Injury to dura

Main complications of otitis media:

(1) **Mastoiditis**
(2) **Labyrinthitis**
(3) **Osteomyelitis skull**
(4) **Lateral sinusitis and jugular vein thrombosis**
(5) **Meningitis**
(6) **Intra-cranial abscess:**
(a) Extradural
(b) Subdural
(c) Brain: (α) Cerebral
(β) Cerebellar
(7) **Facial paralysis**

(III) MASTOID:

(1) ACUTE MASTOIDITIS:

Def: Suppurative inflammation of mastoid antrum &/or, accessory cells

Path: (1) Varieties:
(a) Conjuncto-phlegmon: generalised
(b) Empyema
(c) Acute necrosis
(2) Factors:
(a) **Anatomical structure:**
(α) Cellular: bony affection
(β) Diplœtic } cranial extensi
(γ) Eburnated }

(*b*) **Nature of infection:**
- (α) Streptococcus: fulminating
- (β) Pneumococcus: mild

(*c*) **Resistance of the patient:** Diabetes

Clinic: (1) **Pain:** (*a*) Earache
- (*b*) Headache

(2) **Tenderness:**
- (*a*) Tip
- (*b*) Supra-meatal triangle
- (*c*) Posterior margin of the mastoid

(3) **Swelling:** Above and behind the ear

(4) **Displacement of auricle:** Anterior & lateral

(5) **Otoscopy:** Perforated membrane:
- With: (*a*) Cessation of discharge
- : (*b*) Too free discharge
- : (*c*) Œdema & swelling of posterior meatal wall

(6) **Pyrexia** and toxæmia

Clinical Types: (1) **Typical** mastoiditis
- (2) Mastoiditis with **abscess**
- (3) G[illegible]
- : [illegible]
- (4) [illegible]
- (5) **Zygomatic** mastoiditis: trismus
- (6) **Meatal** mastoiditis

Compl: (1) Mastoiditis with neck extension:
- (*a*) **Bezold's** mastoiditis:
  - : Pus into sternomastoid sheath
- (*b*) **Digastric** abscess: Citelli

(2) Mastoiditis with pharyngeal extension:
- : **Retro-pharyngeal** abscess

(3) Mastoiditis with **petrosal** infection

(4) Mastoiditis with **cranial** extension:
- : Osteomyelitis cranium: temporal, occipital

(5) Mastoiditis with **intra-cranial** extension:
- (*a*) Sinus thrombosis → vein thrombosis
- (*b*) Extra-dural abscess
- (*c*) Meningitis
- (*d*) Subdural abscess
- (*e*) Cortical abscess: (α) Cerebral
  - (β) Cerebellar

Treat: Mastoidectomy of Schwartze:

Ind: Every case of acute mastoiditis must be operated upon when:
- (*a*) One clean incision of the drum fails to relieve:
  - (α) Pain
  - (β) Headache

(γ) Tenderness
(δ) Pyrexia
(b) Mastoid tenderness after drum perforation
(c) Onset of intra-cranial signs:
(α) Headache
(β) Drowsiness
(γ) Vertigo
(δ) Facial paralysis
(d) Pyrexia with profuse discharge
(e) Swelling of roof and post. wall of bony meatus

Time: Immediate, unless subsiding

Anæsth: Local or general

Tech: Stage I: (a) Incision ½" behind pinnal attachment from top to mastoid tip
(Avoid trauma to facial nerve in child)
(b) Periosteal incision and detachment
(c) Automatic retractor (self retaining)

Stage II: (a) Follow a sinus or carious bone upto the antrum
or (b) Gouge behind Henle's spine upto the antrum

Stage III: (a) Recognise the aditus
(b) Exposure of the antrum
(c) Exposure of accessory cells
(α) Antral cells: Supra—
Ante—
Retro—
(β) Zygomatic cells
(γ) Apical cells
(δ) Angular cells
(d) Exposure of lateral sinus

Stage IV: (a) Closure: few interrupted sutures
(b) Drainage . tube

After-treat: (1) Local:
(a) Syringing: 2nd day
(b) Change of pack: 3rd day to 3 weeks
(c) Removal of tubes: 5th to 10th day
(2) General:
(a) Sulphonamide group
(b) 10% saline 20 c.cs. intravenously

Oper. compl: (1) Failure to find antrum:
: Hug the temporal floor and meatal wa
(2) Damage to lateral sinus:
: Muscle or fascial graft pack
(3) Injury to dura: intra-cranial extension

(4) **Injury to facial nerve:** Facial paralysis
(a) Observe for facial twitches during operation; *if nerve is injured:*
↓ (b) Immediate suture
or (c) Nerve graft inlay: Duel-Ballance

(5) Injury to external semicircular canal

(2) CHRONIC MASTOIDITIS:

Etio: (a) Acute mastoiditis
(b) Chronic otitis media

Path: Chronic osteomyelitis and periostitis of mastoid

Clinic: (1) History and signs of **otitis media**
(2) History or no history of acute mastoiditis
(3) Chronic abscess, **Sinus**, Granulations } **over the mastoid**

Compl: As in otitis media and mastoiditis

Treat: **Radical mastoid:** (See under chronic otitis media)

(IV) OTITIC LATERAL SINUS THROMBOSIS:

Path: Spread routes:

(1) ***Extension:*** *Mastoiditis*
↓ Osteomyelitis
↓ Peri-sinus abscess: (present or absent)
↓ Pachymeningitis
↓ Sinus thrombosis

(2) **Venous:** Mastoiditis
↓ Emissary mastoid phlebitis
↓ Sinus thrombosis

(3) **Labyrinth:** Mastoiditis
↓ Labyrinthitis
↓ Extra-dural abscess
↓ Sinus thrombosis

(4) **Post-operative:** Trauma

Clinic: (A) **General:**
(1) Continuance of **pyrexia** for more than 48 hours after mastoidectomy
(2) Oscillating temperature with **rigors**
(3) Pyrexia out of all proportions to local conditions
: More than 101°

(B) **Local:**
(1) Evidence of *osteomyelitis over sinus wall*
(2) Discoloration, **granulations** or peri-sinus abscesses on the sinus surface
(3) Sinus resistant to delicate palpation

Diagnosis : Of side :
Pressure on opposite jugular vein :
↓ (a) Raises the cerebrospinal fluid pressure
+ (b) Engorges the optic disc

Compl : (1) **Septicæmia and pyæmia**
(2) **Jugular thrombosis**
(3) Abscess : (a) Intra-dural
(b) Intra-cerebellar
(4) Pia-arachnoiditis
(5) Encephalitis
(6) Cavernous sinus thrombosis

Treat : Operative :
: Schwartze + Lateral sinus + Int. jugular vein

Tech : (1) Schwartze
↓ (2) Incision along superior curved line of occiput
↓ (3) Exposure of squamo-parieto-mastoid sutures
↓ (4) Exposure of lateral sinus
↓ (5) Plug between sinus and bone
↓ (6) Incision into the sinus
↓ (7) Excision of the clot
↓ (8) Ligation of internal jugular vein :
Ind : (a) Pus and debris from jugular end of sinus
(b) No free flow of blood from jugular end
(c) Linear swelling in the neck
Tech : Incision . along anterior border of sternomastoid
Place of ligature : (a) Below the clot
(b) Above common facial vein
Cut between two ligatures
Drainage of cephalic end

After-treat : (A) Dressings :
(a) Change of outer dressings : after 24 hours
(b) Change of wound pack : after 4 days
(c) Change of sinus plug : after 8 days
(B) Blood transfusion
(C) Serum and vaccine treatment

(V) OTOGENOUS LEPTO-MENINGITIS :

Def : Pyogenic inflammation of pia-arachnoid
Path : Paths of infection :
(1) Direct extension
(2) Anatomical channels
(3) Venous thrombosis
(4) Rupture of brain abscess
(5) Blood stream
Clinic : (1) Headache
(2) Pyrexia
(3) Stiff neck
(4) Kernig

(5) Irritation or coma
(6) Eye signs: papillœdema, nystagmus
(7) Lumbar puncture: fall of chlorides & glucose

Treat: (1) **Conservative: Kubie's Forced Drainage**·
(*a*) *Lumbar puncture:*
+(*b*) Intravenous:
: 2 to 3 litres of ·45% hypotonic saline in one to three hours

(2) **Operative: Drainage**
(A) Suppurative labyrinthitis with *meningitis*:
: Trans-labyrinthine drainage
(B) Cortical abscess with meningitis:
: Drainage of cortical abscess
(C) Sinus thrombosis with meningitis:
: Drainage of sinus
(D) Mastoiditis with meningitis:
: Drainage
Tech: (*a*) Schwartze
(*b*) Exposure of sinus and cerebellum
(*c*) Excision of tegmen and squama
(*d*) Excision of zygoma
(*e*) Excision of solid angle of petrous
(*f*) Drainage of the area

(VI) OTITIC INTRA-CRANIAL ABSCESS:

Varieties: (A) **Extra-dural abscess:**
(*a*) Over **lateral sinus**
(*b*) Over **zygomatic** region
(*c*) Over **petrous** region
(B) **Subdural abscess:**
: Above tegmen tympanii
(C) **Cortical abscess:**
(*a*) Cerebral: temporo-sphenoidal
(*b*) Cerebellar:

Pathology: *Routes of infection:*
(*a*) Direct extension
(*b*) Perivascular sheath
(*c*) Thrombosed veins
(*d*) Endarteritis and embolism
(A) Cerebral abscess:
: Direct extension through tegmen
(B) *Cerebellar abscess: through*
(*a*) Labyrinth
(*b*) Thrombosed lateral sinus
(*c*) Osteitis: Trautmann's triangle

Stages : (*a*) Spreading encephalitis
(*b*) Encapsulation
(*c*) Encapsuled softening

Clinic : (A) **Sepsis :**
(1) Local focus : ear, mastoid
(2) General toxæmia : (*a*) Active
(*b*) Passive
(3) Laboratory : (*a*) Leucocytosis
(*b*) C. S. Fluid

(B) **Intra-cranial pressure :**
(1) Headache
(2) Affections of consciousness
(3) Vomiting
(4) Papillœdema
(5) Bradycardia
(6) High blood and C. S. F. pressure

(C) **Localising signs :**
(1) **Cerebral** abscess : temporo-sphenoidal
(*a*) Word amnesia
(*b*) Homonymous contra-lateral hemianopia
(*c*) Ocular palsies
(*d*) Contra-lateral hemiplegia
(*e*) Contra-lateral hemi-anæsthesia

(2) **Cerebellar** abscess :
(*a*) Asynergia
(*b*) Hypermetria
(*c*) Dysdiadokokinesis
(*d*) Hypotonia and paresis
(*e*) Cerebellar catalepsy
(*f*) Nystagmus and skew deviation
(*g*) Ataxy and vertigo

(D) **Special signs and investigations :**
(*a*) Stereoscopic X-Ray films
(*b*) Lumbar puncture
(*c*) Ventricular puncture

Diff. diag : (1) Encephalitis lethargica
(2) Cerebrospinal meningitis
(3) Otitic hydrocephalus
(4) Otitic extra-cranial complications
(5) Other causes of intra-cranial tension rise

Treat : **Operative :**

Ind : (A) **Urgent decompression :**
: In acute stage

(B) **Secondary drainage :**
; Extension of ear operation

(C) **Primary drainage:**
- (*a*) Good encapsulation:
  - : 4–6 weeks after the advent of intracranial signs
- (*b*) Clear cerebrospinal fluid with intracranial signs

Tech: (1) Ear or mastoid operation
- ↓ (2) Exposure of dura in suspected area:
  - (A) Cerebellar.
    - (*a*) Medial extension. through internal ear
    - (*b*) Posterior extension: internal to lateral sinus
    - (*c*) Independent : through suboccipital region
  - (B) Cerebral:
    - Superior extension: through tegmen
- ↓ (3) Inspection of dura mater:
  - (*a*) Fistulæ, granulations, abscesses, adhesions
  - (*b*) Signs of brain abscess:
    - (α) Extension of sepsis inside dura
    - (β) Absent dural pulsations
    - (γ) Hernia cerebri
- ↓ (4) Incision of dura mater
- ↓ (5) Exploration of the brain:
  - : By needles and fingers
- ↓ (6) Drainage:
  - (*a*) Superficial abscess open drain
  - (*b*) Deep abscess: closed drain
- or (6) Enucleation of the whole cortical abscess

After-treat: See under brain abscess

IMPORTANT POINTS

(1) Forceps are the most useless and dangerous weapons for the removal of a foreign body from a ear.

(2) Pain due to furuncle ear is worse on mastication or by pulling on or pressing the pinna or meatus; pain due to mastoiditis is unaffected.

(3) *Furunculosis of the meatus:*
- (*a*) Look for ear disease
- (*b*) Look for general disease.

(4) If after a conscientious examination you cannot differentially diagnose between furuncle and mastoiditis, patient may have both.

(5) If after post-aural incision for post-aural meatal furuncular abscess, bare bone is found, it is mastoiditis.

(6) Examination of the drum should be the routine in all cases of unexplained pyrexia in children and in all cases of cerebral signs whatever the age.

(7) Otitis media treatment :
- (*a*) Subsiding otitis media without perforation drum :
  : Conservative
- (*b*) Subsiding otitis media with perforation drum :
  : Conservative and observative
- (*c*) Acute signs with bulging drum :
  : Incise the drum
- (*d*) Acute signs with perforation drum :
  : Enlarge the perforation.

(8) If pain and pyrexia return or continue after an incision of the drum :
: Explore the mastoid.

(9) Tenderness over the mastoid in the presence of free discharge :
: Mastoiditis.

(10) Intra-cranial invasion in acute mastoiditis is suggested by :
- (*a*) Slow pulse rate
- (*b*) Persistent headache
- (*c*) Drowsiness
- (*d*) Squint
- (*e*) Vertigo

(11) Accessory mastoid cells :
- (*a*) Squamous
- (*b*) Sub-labyrinthine
- (*c*) Sinus plate
- (*d*) Marginal
- (*e*) Tip
- (*f*) Retro-facial
- (*g*) Peri-tubal
- (*h*) Floor of the middle fossa
- (*i*) Zygomatic
- (*j*) Petrosal

(12) Radical mastoid operation should never be undertaken on an ear in which there is useful hearing, unless there are serious complications.

(13) Chronic otitis media is the result of acellular mastoid.

(14) Never curette inner wall of the middle ear, as it contains :
- (*a*) Facial nerve
- (*b*) Labyrinth
- (*c*) Carotid canal.

(15) Persistence of pain and temperature in the presence of free discharge :
- (*a*) Mastoiditis ?
- (*b*) Labyrinthitis ?
- (*c*) Lateral sinus thrombosis ?
- (*d*) Meningitis ?

(16) Posterior perforation in typanum : mastoiditis

(17) Stages of radical mastoid:
- (*a*) Schwartze
- (*b*) Exposure and removal of osseous meatal wall
- (*c*) Removal of outer wall of attic
- (*d*) Removal of ossicles
- (*e*) Plastic stage
- (*f*) Drainage.

(18) Main complications of otitis media:
- (1) Mastoiditis
- (2) Labyrinthitis
- (3) Osteomyelitis cranium
- (4) Lateral sinus thrombosis → jugular vein thrombosis
- (5) Meningitis
- (6) Intra-cranial abscess:
  - (*a*) Extra-dural
  - (*b*) Subdural
  - (*c*) Cortical: (α) Cerebral
    (β) *Cerebellar*
- (7) Facial paralysis.

(19) In every case of otitis and ear trouble, examine the pharynx, tonsils and adenoids.

(20) Temperature over 101° in an adult with mastoiditis, examine the lateral sinus.

(21) If there is septicæmia without thrombosis, do not disturb the sinus.

(22) Treatment of septic sinus thrombosis:
- (*a*) Removal of the whole infected bone
- (*b*) Isolation of infected area from general circulation by ligature between the focus and heart
- (*c*) Drainage of the infected sinus

(23) Except for extra-dural abscess, lateral sinus thrombosis is the most common intra-cranial complication of ear trouble.

(24) Do not tie internal jugular vein without dealing with infected sinus; otherwise thrombosis will extend high up.

(25) Condition of the cerebro-spinal fluid is the most reliable test of the stage of cortical abscess:
- (*a*) Turbid fluid with cells and organisms:
  : Encephalitis
- (*b*) Clear fluid with intra-cranial signs:
  : Intra-cortical abscess.

(26) Clinical signs of intra-cranial abscess:
- (A) Sepsis: (*a*) Septic focus
  - (*b*) General toxæmia: (*a*) active
    (*b*) passive
  - (*c*) Leucocytosis
  - (*d*) Cerebro-spinal fluid

(B) Intra-cranial pressure:
- (*a*) General: (1) Headache
  - (2) Vomiting
  - (3) Papillœdema
  - (4) Bradycardia
  - (5) High blood and C. S. F. pressure.
- (*b*) Anterior chamber:
  - : Affections of consciousness.
- (*c*) Posterior chamber:
  - (*a*) Retraction of head
  - (*b*) Stiff neck
  - (*c*) Kernig

(C) Localising: (*a*) Functional, (*b*) Sensory, (*c*) Motor, (*d*) Reflex, (*e*) Trophic — (*a*) Cerebral, (*b*) Cerebellar

(27) Important clinical signs of intra-cranial tension are:
- (*a*) Headache
- (*b*) Papillœdema
- (*c*) Bradycardia
- (*d*) Affections of consciousness.

(28) Clinical signs of: Intra-cranial tension + Ear focus = Intra-cranial complication of ear disease.

(29) No case of brain abscess is inoperable until the patient is actually dead.

(30) Preliminary treatment of tonsils and adenoids is essential in every case of ear trouble.

CHAPTER IV

THE NECK

(I) CONGENITAL ABNORMALITIES:

(1) DERMOIDS:

Etio: Adolescents

Path: Sequestration

Clinic: **Midline,** subcutaneous, globular, cystic tumour

Diff. diag: From any other cystic swelling:
- (*a*) **Thyroglossal cyst**
- (*b*) **Perichondral thyroid abscess**
- (*c*) **Subhyoid bursa**

Treat: Excision

(2) BRANCHIAL ABNORMALITIES:

(A) BRANCHIAL CYST:

Def: Distension cyst in connection with an unobliterated portion of branchial cleft

Etio: **Early adult life**

Path: (*a*) Wall:
- (α) External cyst: squamous lined
- (β) Internal cyst: columnar lined

(*b*) Contents:
- (α) **Cholesterol crystals**
- (β) Sebaceous material: in external cyst
- (γ) Glairy fluid: in internal cyst

(*c*) **Sites:**
- (1) **Third cleft:** Precervical sinus
  - (α) **Below and behind mand. angle**
  - \+ (β) Behind ant. border of sternomastoid
  - \+ (γ) Level of hyoid or thyroid cartilage
- (2) **Second cleft:**
  - : Below the mastoid
  - : Extending towards the floor of the mouth

Clinic: Globular **cystic swelling** at the **special sites**

Diff. diag: (*a*) Caseous tuberculous gland: **cold abscess**
- (*b*) **Sebaceous cyst**
- (*c*) **Aneurysm**

Compl.: (*a*) Sepsis
- (*b*) Malignancy

Treat: Excision

(B) BRANCHIAL SINUS:

Etio: **Infancy**

Path: (*a*) Origin:
: Failure of obliteration of cervical sinus

(*b*) Morb. anat:
: Columnar-lined tract from inferior cervical region to tonsillar fossa, passing between the carotids

(*c*) **Site**:
(α) **Above the sternoclavicular joint**
+ (β) Anterior to the sternomastoid

Clinic: **Chronic sinus** opening at the **special site**

Diag: (*a*) Subcut. purse-string suture (pre-operative)
(*b*) X-Rays after lipoidol

Treat: **Excision**:
(*a*) Incision: low collar, surrounding the opening
↓ (*b*) Dissection: of the tract upto thyroid cart. level
↓ (*c*) Incision: collar, at the level of thyroid cart.
↓ (*d*) Dissection: deep

(C) BRANCHIAL CARTILAGE:
: Persistent cartilage at the site of one of the branchial clefts

(D) CERVICAL AURICLE:
: Pendulous skin fold in the lower cervical region

(3) THYROGLOSSAL ABNORMALITIES:
(See under Thyroid)

(A) LINGUAL THYROID

(B) THYROGLOSSAL CYST

(C) THYROGLOSSAL SINUS

(D) ABERRANT THYROID

(II) TRAUMA:

(1) WOUNDS OF THE NECK:

Varieties: (A) **Cut throat**:
(*a*) **Suicidal**:
(α) High situation:
: Between hyoid and thyroid cart.
(β) Wound from left to right:
: (in right handed)
(γ) Respiratory passages bear the brunt

(B) **Stab wounds:**
- (a) Root of the neck
- (b) Complications out of proportion to external wound:
  - (α) Hæmorrhage
  - (β) Trauma to: (1) Respiratory passages
    - (2) Œsophagus
    - (3) Nerves
    - (4) Spine

Compl: (1) **Traumatic:** Trauma to deeper structures
(2) **Septic:** Infection and its consequences

Treat: (A) Mild cases:
- (a) Excision of ragged edges
- (b) Exploration
- (c) B.I P.P. of exposed tissues
- (d) Closure without drainage

(B) Serious cases:
- (a) **Free exposure and exploration of:**
  - (1) Pharynx, larynx, trachea
  - (2) Œsophagus
  - (3) Great vessels
  - (4) Nerves
  - (5) Thoracic duct
- (b) Treatment of affected structures
- (c) Closure:

With: (1) Drainage
(2) Laryngotomy } if required
or (3) Tracheotomy }

(C) Gunshot wounds: (Dollfuss case)

(2) FRACTURE-DISLOCATIONS OF CERVICAL SPINE: (See under spine)

(III) ACUTE INFLAMMATIONS OF THE NECK:

(A) SUPERFICIAL: To the deep fascia
- (1) CARBUNCLE: (See under skin)
  Site: Nape of the neck
- (2) ERYSIPELAS: (See under skin)
- (3) ANTHRAX: (See under anthrax)
- (4) SECONDARY: To deeper foci: lymphadenitis etc.

(B) DEEP: To the deep fascia
- (1) CERVICAL CELLULITIS:

Etio: (a) Primary: primary focus in the neck

(*b*) Secondary:
  (α) Oral sepsis → lymphadenitis → cellulitis
  (β) Extension of: Parotitis, mastoiditis,
  : Mandibular osteomyelitis

Clinic: (*a*) Diffuse, spreading, brawny, inflammatory swelling
(*b*) General toxæmia

Treat: (1) General: sulphonamide group
(2) Specific: sera
(3) Local:
  (*a*) Conservative: rest, heat, rubefacients
  (*b*) Operative: Transverse incisions
  Hilton's method
  Hypertonic packs
  Rubber tissue drainage

Post. treat: **Keep the tracheotomy set ready at hand**

(2) LUDWIG'S ANGINA:

Def: **Diffuse cellulitis of:**
  (*a*) Submaxillary region
  +(*b*) Floor of the mouth

Etio: Septic focus in submaxillary region or oral cavity

Path: Streptococcus or special bacillus

Clinic: (*a*) Diffuse, indurative, inflammatory, submaxillary and submental swelling
+(*b*) Œdema of the floor of the mouth
↓ Displacement of the tongue

Diff. diag: (*a*) **Acute osteomyelitis jaw**
(*b*) Acute submaxillary **lymphadenitis**
(*c*) Acute submaxillary **sialo-adenitis**

Treat: (1) Conservative: (See above)
(2) Operative:
  (*a*) Anæsth: (α) Cervical block
  (β) Chloroform: (avoid ether)
  (*b*) Tech: (α) Incisions:
  (1) Symphysis menti to hyoid
  or (2) Along the lower border of the jaw
  (β) Evacuate by Hilton's method
  (γ) Division of myelohyoid fibres
  (δ) Drainage
  (*c*) Post. treat: (α) Local: Hypertonic saline pack
  or, Saturated mag. sulph. pack
  or, 10% glycerine ichthyol
  Rubber tissue drain
  (β) General: Sulphonamide group
  Antisera

Complications: Of any acute inflammation in the neck:

(1) **Œdema of the glottis**
(2) **Aspiration pneumonia**
(3) **Sloughing**
(4) **Secondary hæmorrhage**
(5) Venous thrombosis → septic embolism
(6) Mediastinitis

(3) ACUTE CERVICAL LYMPHADENITIS: (See below)

(4) ACUTE TUBERCULOUS CELLULITIS OR PERILYMPHADENITIS:
: Complication of tuberculous lymph glands

(5) ACUTE THYROIDITIS (See under Thyroid)

(IV) CHRONIC INFLAMMATIONS OF THE NECK:

(1) CHRONIC CERVICAL CELLULITIS:

Etio: Secondary to: (a) Acute cellulitis
(b) Chronic septic focus in the neck
(c) Spreading cellulitis elsewhere

(2) CHRONIC TUBERCULOUS CELLULITIS:

Syn: T. B. peri-adenitis
Etio: Secondary to chronic tuberculous lymph glands

(3) ACTINOMYCOSIS:

Site: Below and behind the **angle of the jaw**
Clinic: (a) *Multiple* ***sinuses*** *with widespread fibrosis*
(b) Diffuse **induration**
(c) Yellow **granules** in the discharge
(d) Lymph glands not involved
Treat: (1) Heavy doses of: **Pot. Iodide**
: Iodised milk
(2) Scraping

(4) SUBCUTANEOUS OR MUSCULAR GUMMA:
: With secondary infection

(5) LYMPHANGIOMATOUS CELLULITIS:

Clinic: Recurrent attacks of streptococcal lymphangitis in cystic hygroma
Treat: (a) **Sulphonamide** group
(b) Anti-streptococcal serum

(6) WOODY PHLEGMON OF RECLUS:

Path: Chronic staphylococcal cellulitis of the neck
Clinic: Extreme chronicity and induration
Diff. diag: (a) Actinomycosis
(b) Malignancy
(c) Syphilis

(V) AFFECTIONS OF THE CERVICAL LYMPH SYSTEM: (See under Lymphatics)

(1) TRAUMA TO THORACIC DUCT:

Etio: (*a*) Stab wounds
(*b*) Operative trauma

Clinic: (1) Lymphorrhœa
(2) Chylorrhœa: after meals

Compl: Inanition cachexia

Treat: (*a*) Conservative: pressure bandage
(*b*) Operative: ligature

(2) ACUTE SEPTIC LYMPHADENITIS:
(See under Lymphatics)

Etio. **Septic:** (*a*) **Teeth**
(*b*) **Tongue**
(*c*) **Tonsils**
(*d*) **Ear**
(*e*) **Scalp**

Clinic: (*a*) Stage of pain and stiffness
↓ (*b*) Stage of tender localised induration
↓ (*c*) Stage of acute lymphadenitis
↓ (*d*) Stage of acute periglandular cellulitis
↓ (*e*) Stage of acute glandular abscess
(α) Superficial
(β) Retropharyngeal

Treat: (1) Conservative: in early stages
↓ (2) Operative. in suppuration

(3) CHRONIC SEPTIC LYMPHADENITIS:
(See under Lymphatics)

Etio: (1) Primarily chronic
(2) Secondary to acute lymphadenitis
Primary foci: (See above)

Clinic: (*a*) Chronically **enlarged and tender but mobile** *glands, with a primary chronic septic focus* in catchment area
(*b*) Chronic **unresolving mass,** persisting after the opening of a glandular abscess

Treat: Excision

(4) TUBERCULOUS CERVICAL ADENITIS:
(See under Lymphatics)

(A) **General:**

Etio: General tuberculous diathesis

Clinic: Discrete, palpable enlargement of all glands with no peri-adenitis.

Treat: (*a*) General anti-tuberculous treatment:
: Heliotherapy; ultra-violet rays
(*b*) Avoid operative interference:
: Unless conservative

(B) **Local:**

Etio: Some local focus: **Tonsil**

Clinic: (*a*) Tender, fleshy enlargement of a gland with a chronic septic primary focus
↓ (*b*) **Discrete** enlargement of surrounding glands
↓ (*c*) Peri-adenitis and **matting** surrounded by discrete glands
↓ (*d*) Central **caseation**, surrounded by peri-adenitis and matted glands, surrounded by discrete enlarged glands
↓ (*e*) Tuberculous **cellulitis**
↓ (*f*) Tuberculous **abscess:**
: Collar-stud, retropharyngeal
↓ (*g*) Tuberculous **ulcer or sinus**

Compl: (1) Implication of important structures
(2) Pressure syndrome
(3) Tuberculous cellulitis
(4) **Cold abscesses**
(5) **Scrofulodermia**

Treat: (1) Conservative: ultra-violet exposures
(2) Operative:
Ind: (*a*) Single gland or group of glands not subsiding or progressing [illegible]
(*b*) [illegible]
(*c*) [illegible]
Contraind: (*a*) **Diffuse involvement**
(*b*) Massive involvement
(*c*) Bad general condition
Tech: (1) Un-complicated mass:
: Excision
(2) Mass with caseating foci:
: Drainage of caseating material
↓ Excision
(3) Mass with scrofulodermia:
: Scraping and B. I. P. P.
↓ Excision
(4) Collar-stud abscess:
: Incision and drainage
+ Dilation of fascial hiatus
+ Scrape out the gland

Post-treat: General and local anti-tuberculous

(5) SYPHILITIC CERVICAL ADENITIS:

Clinic: (1) **Discrete,** mobile, fleshy or shotty, generalised enlargement, **all glands being of uniform moderate size**
(2) Enlarged glands in other regions
(3) Other evidence of syphilis

(6) NEW GROWTHS OF CERVICAL LYMPH SYSTEM:

(A) LYMPHANGIOMA:

(*a*) **Cystic hygroma:** Hydrocele of the neck
Etio: **Infants** and children
Site: **Supraclavicular** → axilla or mediastinum
Clinic: **Multilocular,** thin-walled, translucent, **bluish** swelling
Compl: Recurrent streptococcal **inflammatory attacks**
Treat: (1) **Conservative:** In children and large cases
(2) Anti-streptococcal treatment

(*b*) **Solitary lymph cyst:**
Etio: **Adults**
Site: Supraclavicular
Clinic: Thin-walled, translucent, bluish cyst
Treat: (*a*) Sclerosing injections: quinine urethane
(*b*) Marsupialisation: with gauze pack
Post. compl: (*a*) Cellulitis
(*b*) Sinus formation: with lymphorrhœa

(B) HODGKIN'S DISEASE:

Clinic: (*a*) **Discrete,** rubbery, **big enlargement** of one group → enlargement of other groups (axilla, groin, mesentery)
(*b*) Enlarged **spleen**
(*c*) **Anæmia**
(*d*) Pel-Ebstein syndrome
Diag: Biopsy
Compl: Pressure effects
Treat: (*a*) Deep X-Rays
(*b*) Arsenic

(C) LYMPHO-SARCOMA:

Clinic: Enlargement of local glands:
(*a*) **Rapid, extensive, infiltrating** growth
(*b*) Infiltration of other structures with its consequences
Treat: Deep X-Rays

(D) SECONDARY CARCINOMATOUS OR SARCOMATOUS GLANDS:

Clinic: (*a*) Hard or soft infiltrating mass of glands

(*b*) Primary malignancy in catchment area:
- (1) **Tongue**
- (2) Tonsils
- (3) Jaw
- (4) Pharynx
- (5) **Larynx**

Compl: (*a*) Infiltration of other structures
(*b*) **Fungation:**
- (1) Sepsis
- (2) Secondary hæmorrhage

(*c*) Occasionally, softening

SUPRA-CLAVICULAR MALIGNANT ADENOPATHY:

Etio: Carcinoma:
- (*a*) **Breast**
- (*b*) **Thyroid**
- (*c*) **Œsophagus**
- (*d*) **Intra-abdominal**
- (*e*) **Testis**

(VI) AFFECTIONS OF THE CERVICAL VESSELS:

(See under Vessels)

(1) ANEURYSMS:

Sites: (A) **Common carotid:**

Site: Bifurcation

Clinic: (*a*) Local pulsatile swelling
(*b*) Pressure syndrome:
- (1) Nerves:
  : glossopharyngeal
  vagus
  accessory
  hypoglossal
  cervical plexus
  brachial plexus
- (2) Trachea: dyspnœa
- (3) Œsophagus: dysphagia
- (4) Larynx: displacement

(*c*) Intra-cranial symptoms:
: pain and noises
vertigo
hemiplegia

Treat: (See under Vessels)

Post. compl: Cerebral

(B) **Subclavian:**

Site: First and third parts
Etio: Right side, men
Clinic: (a) Local pulsatile swelling
(b) Pressure syndrome:
(1) Dilated superficial veins
(2) Brachial neuralgia
(3) Paresis of the arm
(4) Œdema of the arm
(5) Erosion of the clavicle
Treat: (See under Vessels)
Post. compl: Gangrene of the superior extremity

(2) THROMBO-PHLEBITIS: **Internal jugular vein:** (See under Ear)

Etio: Spread from lateral sinus thrombosis
Clinic: (a) All signs of lateral sinus thrombosis
+(b) Tender cord-like swelling in the neck
Treat: (1) Ligature: between the thrombus and heart
↓ (2) Thrombectomy and drainage of cranial end

(3) VASCULAR NEW GROWTHS:

(A) HÆMANGIOMA:

Clinic: Deep, non-translucent, sponge-like, **compressible**

(B) CAROTID BODY TUMOUR:

Syn: 'Chromaffin tumour'
'Potato tumour'
Path: (a) Innocent endothelioma
(b) Malignant
Site: Carotid bifurcation
Clinic: Pulsatile (non-expansile), painless, slow, round, lobulated, encapsuled, firm tumour
Diff. diag: (a) Aneurysm
(b) Enlarged lymph gland
(c) Aberrant thyroid
Compl: Malignant degeneration
Treat: (a) Preliminary ligature of common carotid
↓ (b) Excision of the tumour together with the carotid bifurcation

(VII) NEW GROWTHS IN THE NECK:

(1) SUBCUTANEOUS TISSUE GROWTHS:

(A) LIPOMA:

Sites: (a) Sub-mandibular
(b) Sub-occipital: (? meningocele)
Clinic: Diffuse or big localised

(B) NEURO-FIBROMA: molluscum fibrosum

(C) LYMPHANGIOMA: (See above)
- (1) **Cystic hygroma:** Hydrocele of the neck
- (2) **Solitary lymph cyst**

(D) HÆMANGIOMA

(2) LYMPHATIC GLANDULAR GROWTHS:
- (A) LYMPHADENOMA
- (B) LYMPHOSARCOMA
- (C) SECONDARY GLANDULAR CARCINOMA OR SARCOMA

(3) GROWTHS FROM SPECIAL ORGANS: (See under those organs)
- (A) **Salivary gland:** Mixed tumour
- (B) **Pharynx and Larynx:**
  - (1) Naso-pharyngeal
  - (2) Oro-pharyngeal
  - (3) Epi-laryngeal } Extrinsic laryngeal
  - (4) Pyriform fossa } Extrinsic laryngeal
  - (5) Laryngeal: intrinsic
  - (6) Hypo-pharyngeal
- (C) **Thyroid**
- (D) **Œsophagus**

(4) GROWTHS SPECIAL:
- (A) CAROTID BODY TUMOUR: (See above)
- (B) BRANCHIOGENETIC CARCINOMA:

Path: Squamous carcinoma in branchial remains

Clinic: Deep squamous carcinoma: with
- (a) No primary focus
- (b) Not situated in a lymph gland
- (c) Situated at the site of branchial cleft

(VIII) DEFORMITIES OF THE NECK:

(1) TORTICOLLIS:

Def: Deformity of the neck causing deviation and rotation of the head due to permanent shortening or spasm of the muscles on one side

Varieties:
- (1) **Congenital:** Sternomastoid tumour
  ↓ Myositis fibrosa
- (2) **Acquired:**
  - (A) Traumatic
  - (B) **Spastic:**
    - (α) Trauma
    - (β) Inflammation
    - (γ) Nervous

(C) **Reflex :**
(α) Inflammatory focus
(β) T. B. spine
(D) Compensatory : scoliosis
(E) Spasmodic : habit tics
(F) **Mechanical :** Scars
(G) Ocular : habit
(H) Paralytic : infantile paralysis
(I) Hysterical

(A) **Acute :** Painful
(1) **Spastic :**
(*a*) Trauma
(*b*) Inflammation
(*c*) Nerve irritation
(2) **Reflex :**
(*a*) Acute inflammatory focus
(*b*) T. B. spine

(B) **Chronic :** Painless
(1) **Congenital**
(2) Compensatory
(3) **Mechanical**
(4) Paralytic
(5) Ocular
(6) **Spasmodic**

Clinic : (1) Position :
(*a*) Head : drawn to same side
+ (*b*) Face : turned to opposite side
+ (*c*) Chin : tilted up and pointing to opposite clavicle
(2) Limitation of opposite movements :
(*a*) Painful and spastic : in acute cases
(*b*) Painless and non-spastic : in chronic cases
(3) Deformity :
(*a*) Prominently standing sternomastoid
(*b*) Compensatory spinal scoliosis

(A) **Congenital :**
(1) History of **difficult labour**
↓ (2) Sternomastoid tumour in childhood
↓ (3) Myositis fibrosa : (See under Muscles)

(B) **Acute reflex :**

Etio : Acute inflammatory focus :
(*a*) **Lymphadenitis**
(*b*) Acute abscess
(*c*) Spinal tuberculosis

Clinic : Painful spasm

Treat : Treat the primary focus

(C) Spasmodic:

Etio: Neurotic temperament
Overwork or worry

Path: Disturbance of cortical centres for head movements

Clinic: Spasmodic **clonic** rotatory movements of the head only **during the day**

Treat: (1) Fixation in Plaster-of-Paris
(2) Resection:
(*a*) Spinal accessory
(*b*) Post. divisions of upper cervical nerves
(3) Physiotherapy and suggestion

Treat: Of torticollis in general:
(1) **Manipulations:**
With: (A) Massage and physiotherapy
(B) Retentive apparatus
(2) **Sternomastoid tenotomy:**
(*a*) **Subcutaneous:** When shortening $< 1''$
(*b*) **Open:**
(α) **Low tenotomy:**
(1) Incision:
: Parallel or across;
Low down with skin pulled up
(2) Division: Sternal tendon
↓ Clavicular head
↓ Deep cervical fascia
(Save int. jug. vein by using a director)
(3) Stretching head into correct position
(β) **High tenotomy:**
: Stripping muscle insertion from mastoid
(γ) **Tendon lengthening:**
(1) Incision: along natural fold
(2) Division:
(*a*) Sternal head: close to the bone
(*b*) Clavicular head: below spinal accessory
(*c*) Deep fascia
(3) Corrective manipulations
(4) Suture of the sliding heads

After-treat: (1) **Mobile:**
(*a*) Fixation:
Method: Sand-bags or bandage
Position: Over-corrected
Time: 15 days
(*b*) Movements: passive and active
: from 4th day

(2) **Fixed:** Fixation:
By: Plaster-of-Paris
In: Over-corrected position
For: 6–8 weeks

(2) NECKLESS: **Klippel-Feil disease:**

Etio: Congenital
Path: Fused short vertebral mass
Clinic: (a) Absence of neck
(b) Limitation of head movements
(c) Spinal deformity
Associate: Cervical spina bifida
Diff. diag: (1) Pott's disease
(2) Torticollis
Compl: Death under anaesthesia
Treat: Plastic operation on skin and deep fascia: (Gillies)

(IX) OTHER CONDITIONS IN THE NECK:

(A) STERNOMASTOID MUSCLE:

(1) **Sternomastoid tumour:** (See under Muscles)
: Difficult labour
↓ Birth trauma
↓ Thrombosis and rupture of muscle veins
↓ Firm, spindle-shaped swelling
↓ Congenital torticollis

(2) **Sternomastoid gumma:**
: Firm, rounded swelling in the muscle
↓ Indolent infiltration of subcutaneous tissues
↓ Secondary infection
↓ Liquefaction
↓ Gummatous ulcer

(B) CERVICAL RIB: (See under Nerves)

Etio: Women after 40
Familial
Bilateral

Path:
Clinic:
Diff. diag:
Treat:
} (See under Brachial plexus)

Division of scalenus anticus: For scalenus syndrome
Tech: (a) Incision: Sternoclavicular joint
↓ Posterior triangle of the neck
(b) Division: of sternomastoid origin
(c) Retraction: mesial of phrenic nerve
(d) Division: of scalenus anticus origin
(e) Save: phrenic nerve
pleural dome
subclavian artery

(C) TUBERCULOSIS OF CERVICAL SPINE:

(See under Spine)

(X) *OPERATIONS ON THE NECK:*

Preparation: (1) Efficient face screen
(2) Efficient isolation of the operative field by towels:
: Hair exclusion
(3) Sand-bag under the shoulders with depression of the shoulders

Anæsthesia: (1) Local infiltration
(2) Regional block:
(*a*) Peripheral branches:
: Behind the midpoint of posterior border of sternomastoid
(*b*) Cervical plexus:
: Behind the transverse processes of 2nd, 3rd and 4th cervical vertebræ

Incisions: (1) Along the natural folds: Collar
(2) Along the sternomastoid
(3) Triradiate:
(*a*) Along sternomastoid upto hyoid
+(*b*) From (*a*) to symphysis menti
+(*c*) From (*a*) to mastoid
(4) Angular:
(*a*) Along sternomastoid
↓ (*b*) Along clavicle

Important structures:
(1) Nerves:
(*a*) Cervical branch of facial and facial itself
(*b*) Spinal accessory
(*c*) Lingual
(*d*) Hypoglossal
(*e*) Glossopharyngeal
(*f*) Phrenic
(*g*) Vagus
(*h*) Recurrent laryngeal
(*i*) Brachial plexus and its supra-clavicular branches
(*j*) Sympathetic chain
(2) Vessels:
(*a*) Carotid arteries
(*b*) Internal jugular vein
(*c*) Subclavian vessels
(*d*) Vertebral vessels
(3) Dome of the pleura
(4) Floor of the mouth
(5) Pharynx → respiratory + alimentary passages

Special compl: (*a*) Asphyxia
(*b*) Air embolism

Sutures: (*a*) Always approximate the platysma
(*b*) Subcuticular sutures

Dressings: Avoid tension and movements

(XI) IMPORTANT POINTS

(1) Swellings in the neck:

(A) **Cystic swellings:**

(1) Sebaceous cyst:
: Fixed to the skin at one point

(2) Dermoid cyst:
(1) Midline, entirely subcutaneous
(2) Contains sebaceous material

(3) Branchial cyst:
(*a*) Below and behind mandible
(*b*) Deep to the sternomastoid
(*c*) Does not move on deglutition
(*d*) Contains cholesterol and sebaceous material

(4) Thyroglossal cyst:
(1) Midline, near hyoid
(2) Moves on deglutition
(3) Contains mucoid fluid

(5) Collar-stud abscess:
(*a*) Position of lymph glands
(*b*) Other glands enlarged
(*c*) Inflammatory swelling
(*d*) Non-defined walls

(6) Deep cold abscess:
(1) Primary focus: spine
(2) Site of pointing: posterior triangle
(3) Non-defined walls

(7) Cystic hygroma:
(*a*) Multilocular, undefined limits
(*b*) Thin-walled, bluish and translucent
(*c*) Supra-clavicular

(8) Lymph cyst:
(1) Unilocular, single
(2) Thin-walled, bluish, translucent
(3) Supra-clavicular

(9) Sub-hyoid bursa:
(*a*) Midline, attached to hyoid
(*b*) Moves on deglutition

(10) Perichondral abscess:
(1) Midline or near the midline
(2) Attached to thyroid cartilage
(3) Non-defined walls
(4) Inflammatory
(5) Moves on deglutition

(11) Aneurysm:
: Pulsating swelling in the line of artery

(12) Blood cyst :
: Association with vein or cavernous angioma

(B) **Swellings containing air:**

(1) Œsophageal pouch
(2) Pharyngeal pouch } : Fill up on taking food or drink

(3) Laryngocele :
: Connection with larynx

(4) Pneumatocele.
(*a*) Supra-clavicular
(*b*) Compressible
(*c*) Impulse on cough or strain

(5) Surgical emphysema :
: Crepitant feel

(C) **Solid swellings:**

(1) Lipoma : (*a*) Diffuse, lobulated
(*b*) Sub-mandibular or sub-occipital

(2) Neuro-fibroma :
(*a*) Molluscum fibrosum :
: Small, pedunculated, compressible
(*b*) Plexiform : Cord-like feel

(3) Angioma : Compressible, sponge-like

(4) Lymph glands :
(*a*) Septic : Primary focus
(*b*) T. B.. Peri-adenitis and caseation
(*c*) Syphilis : Discrete, generalised, small
(*d*) Hodgkin : Discrete, large, rubbery
(*e*) Lympho-sarcoma : Rapid, infiltrative
(*f*) Secondary carc. : Primary malignant focus
(*g*) Lymphatic leukæmia : (1) Soft, generalised
(2) Blood picture

(5) Sternomastoid :
(*a*) Tumour : Infants with difficult labour history
(*b*) Gumma : Adults with syphilitic stigmata

(6) Salivary gland : Parotid, submaxillary
(*a*) Chronic inflammation : Position
Duct orifice } , tender
(*b*) Mixed tumour : Position
Lobulation } , non-tender

(7) Goitre : (*a*) Situation
(*b*) Shape
(*c*) Movement on deglutition
(*d*) Associated special signs.

(8) Accessory thyroid.

(9) Carotid body tumour : (*a*) Situation
(*b*) Non-expansile pulsation

(10) Branchiogenetic carcinoma

(D) **Pulsating swellings:**

(1) Aneurysm: expansile
(2) Carotid body tumour: non-expansile

(E) **Midline swellings:**

(1) Deep or plunging ranula
(2) Subhyoid bursitis
(3) Thyroglossal cyst
(4) Sequestration dermoid
(5) Adenoma isthmus of the thyroid
(6) Thyroid cartilage cold abscess
(7) Lipoma: diffuse submental
(8) Sub-mental lymphadenitis

(F) **Swellings mobile on deglutition:**

(1) Thyroid adenoma or goitre
(2) Thyroglossal cyst
(3) Thyroid cartilage cold abscess
(4) Subhyoid bursa.

(2) **Sinuses and fistulæ in the neck:**

(1) Cervical sinus: (*a*) Children
(*b*) Low in the neck, lateral to midline

(2) Thyroglossal sinus: (1) Midline, round about the hyoid
(2) Mobile on deglutition

(3) Tuberculous sinus: Primary focus: lymph gland, spine

(4) Septic sinus: Primary focus: Osteomyelitis jaw
Perichondritis thyroid
Glandular abscess
Infected cysts

(5) Actinomycosis: (*a*) Multiple sinuses
(*b*) Fibrosis with induration
(*c*) Granules in discharge
(*d*) Site: below and behind angle of the jaw.

(3) **Acute inflammations in the neck:**

(1) Boil
(2) Carbuncle
(3) Cellulitis: (*a*) Ludwig's angina
(*b*) Cervical cellulitis
(4) Erysipelas
(5) Acute lymphadenitis
(6) Acute osteomyelitis jaw
(7) Septic thrombosis of internal jugular vein
(8) Anthrax.

(4) **Congenital affections:**

(*a*) Cholesterol crystals are pathognomonic of the contents of a branchial cyst

(*b*) Congenital cysts in the neck:
  (1) Thyroglossal
  (2) Branchial
  (3) Dermoid

(*c*) Remember thyroglossal cyst whenever there is any suppuration or sinus in the submental or subhyoid region

(*d*) Contents from dermoid and external branchial cyst are sebaceous

(*e*) Contents from thyroglossal cyst or sinus, and deep branchial cyst are mucoid

(*f*) Any unexplained tumour in the neck:
  ? Aberrant or accessory thyroid.

(5) **Trauma:**

(*a*) Space between thyroid and hyoid bones, is a common site for suicidal wounds; pharynx is opened; vessels escape

(*b*) Stab wounds: complications are out of all proportions to the external size of the wound.

(6) **Acute inflammations:**

(*a*) Common complications of acute cervical inflammations:
  (1) Œdema glottis
  (2) Aspiration or septic pneumonia
  (3) Mediastinitis
  (4) Secondary hæmorrhage

(*b*) Keep tracheotomy set ready by the side of the patient at all times, in every case of acute inflammation in the neck.

(7) **Lymph glands:**

(*a*) Cervical lymphadenitis: most common causes are:
  (1) Sepsis: *teeth, tongue, tonsils, pharynx*
  (2) Tuberculosis
  (3) Syphilis

(*b*) New growths of lymph glands:
  (1) Secondary carcinoma
  (2) Lympho-sarcoma

(*c*) In every case of carcinomatous glands in the neck:
  : Find out the primary focus: Tongue
  Cheek
  Tonsils
  Pharynx
  Larynx
  [See under (*e*) also]

(*d*) Malignant glands without primary focus:
  ? Pyriform fossa
  ? Involution of primary focus

(*e*) Supra-clavicular adenopathy:
: Examine: (1) Thyroid or œsophagus
(2) Breast
(3) Peritoneal cavity
(4) Testis

(*f*) Whenever there is no obvious primary focus in a case of malignant cervical glands:
: Examine: (1) Base and under-aspect of the tongue
(2) Pyriform fossa
(3) Ext. auditory meatus
(4) Breast
(5) Abdomen
(6) Testis

(8) **New growths**

(*a*) Translucent, bluish swelling in the supra-clavicular region in infants: cystic hygroma

(*b*) Cystic hygroma in the neck: examine the axilla

(*c*) Any unexplained tumour in the neck:
? Gumma
? Aberrant or accessory thyroid

(*d*) Never diagnose branchiogenetic carcinoma, until you are quite sure that there is no primary focus elsewhere

(*e*) Most common malignant growth in the neck:
: Secondary glandular carcinoma

(9) **Deformity: torticollis:**

: In every case of torticollis, an X-Ray plate of the cervical region should be taken before operation, to find out:
(*a*) Cause of the deformity
(*b*) Sequelæ of the deformity

(10) **Cervical rib:**

: Division of scalenus anterior tendon or Adson's operation is an operation of choice in all cases of cervical rib and relieves the pressure more effectively than excision of the rib itself.

(11) **Cervical operations:**

(*a*) No operation on the neck should be performed in the presence of oral sepsis

(*b*) As far as possible, avoid opening the oral cavity, pharyngeal cavity, respiratory passage and alimentary passage into the cellular tissues of the neck;
If unavoidable:
(*a*) Do the operation in two stages
(*b*) Provide ample drainage

(*c*) Local or regional infiltration, alone or combined with light general anæsthesia, is ideal for neck operations

(*d*) Avoid adrenaline for local infiltration in cases of toxic goitre

(*e*) Collar incisions are best in neck

(*f*) Control of bleeding from the large veins of the neck: : Ask the patient to take deep inspirations.

(*g*) Keep saline bowl always at hand; flood the wound with saline in case of trauma to big veins in the lower neck, to avoid air embolism.

(*h*) Never cut anything under tension; never cut without clamping on both sides; always look out for muscle contractions before cutting a suspicious tissue.

(*i*) Do not leave the artery forceps on veins; tie the veins immediately, especially their origins from internal jugular or subclavian; otherwise they may lead to either tearing or thrombosis of the parent vein.

(*j*) Be careful when cutting anything near the thoracic inlet. Troublesome hæmorrhage may follow due to retraction of the tissues cut.

CHAPTER V

THE THORACIC WALL

(1) TRAUMA OF THE CHEST WALL:

(A) NON-PENETRATING INJURIES OF THE CHEST:

(1) SUBPERIOSTEAL CONTUSION OR HÆMATOMA:

Etio: Blows and falls

Clinic: Painful, tender, fixed lump affer trauma

Diff. diag: (a) Fracture rib→callus
(b) Periostitis
(c) New growth

Compl: (1) Infection
(2) Ossification
(3) Periosteal adhesions: intercostal neuralgia

Treat: Conservative

(2) FRACTURE RIB:

(A) Indirect:

Cause: Antero-posterior compression

Path: Outward displacement

Site: Angles of 5th to 8th ribs

Clinic: (1) Local pain on deep inspiration
(2) Local pain on antero-posterior compression
(3) Tenderness
(4) Crepitus
(5) Mobility on pressure over the rib

Treat: **Adhesive strapping: for three weeks**
(a) In full expiration
(b) Beyond the midline anteriorly and posteriorly
(c) Each strap overlapping the other below

(B) Direct:

Cause: Local blows and falls

Path: Inward displacement

Site: At the site of the injury

Clinic: (1) As in (A)
+ (2) Local contusion
(3) Local depression

Compl: (1) **Injury to the viscera:**
(a) Pleura: hæmothorax
(b) Lungs: laceration

(c) Mediastinum
(d) Pericardium
(e) Upper abdomen
(2) Surgical emphysema
(3) Inflammation of the viscera : pleurisy
pneumonia

Treat : (a) Prop-up position
(b) Recumbency with sand-bag in the spinal furrow
(c) Anti-pneumonic prophylactic treatment

(C) **Muscular action :**

Cause : Violent sneeze or cough

(3) FRACTURE STERNUM :

Etio : (a) Direct : run-overs
(b) Indirect : excessive flexion
: In association with fracture spine

Clinic : (1) Deformity
(2) Crepitus

Compl : Injuries to the thoracic viscera

Treat : (1) Recumbency :
: *In extension*
: With pillow between the shoulders
(2) Forcible manipulations → plaster or strapping
(3) Open operation → reduction → plaster

(4) COMPRESSION OF THE CHEST :

Syn : Traumatic asphyxia

Etio : Run-overs
Buffer accidents

Path : Capillary extravasation due to back pressure, caused by sudden rise in intra-thoracic pressure

Clinic : (a) Dusky head, face and neck
(b) Sub-conjunct. and sub-mucous haemorrhages

Treat : Conservative

(5) SURGICAL EMPHYSEMA :

(A) **Subcutaneous :**

Etio : Fracture rib
Clinic : Crepitant feel
Treat : (a) Expectant
↓ (b) Small incisions

(B) **Mediastinal :**

Etio : Wounds of air passages
Clinic : Cyanosis & lividity of neck and face + dyspnœa
Treat : (1) Incision in front of trachea
↓ (2) Suction of the air

(B) PENETRATING INJURIES OF THE CHEST

Etio: Stab wounds; gunshot wounds; broken needles

Clinic: (a) Shock
(b) Wound of entry
(c) Hæmorrhage:
(α) External
(β) Hæmothorax
(γ) Hæmoptysis
(d) Pneumothorax: with or without lung collaj

Compl: (1) **Surgical emphysema**
(2) **Pneumothorax:** (a) Open
(b) Valvular

(A) **Traumatic pneumothorax**
Etio: Stab wounds
Clinic: Increasing dyspnœa and cyanosis
Absent breath-sounds
Hyper-resonance
Cardiac displacement
Treat: Aspiration:
Site: Second inter-costal space
: Two inches from sternum

(B) **Valvular pneumothorax:**
Etio: Laceration of the lung
Clinic: Progressive and extreme signs of pneumothorax with pressure on neighbouring organs
Treat: Inter-costal suction drainage by a catheter

(3) **Hæmothorax:**
Treat: (1) Aspiration } +Blood trans.
(2) Thoracotomy }
(4) Trauma to the lung
(5) Infection: **empyema or pneumonia**
(6) Trauma to: (α) Heart and pericardium
(β) Upper abdominal organs

Treat: (1) First aid: air-tight closure of the wound
(2) Anti-shock treatment and exploration
(3) Debridement and exploration
(4) Suture of the rent in seriatim
(5) Closure without drainage

After-treat: (1) Anti-pneumonic prophylactic
(2) Look for internal complications:
(a) Hæmothorax }
(b) Pneumothorax } : Dyspnœa & cyanosis
(c) Pyothorax }
(d) Pneumonia }

(II) INFECTION OF THE CHEST WALL:

(A) INFECTIONS OF THE SOFT TISSUES:

Etio: (a) Trauma: abrasions
penetrating wounds
drainage routes
(b) Hæmatoma
(c) Suppurating axillary glands
(d) Empyema necessitatis
(e) Respiratory infections

(1) ABSCESSES OF THE CHEST WALL:

(A) Sub-pectoral abscess:

Clinic: (a) Pronounced toxæmia
(b) Widespread abscess under pectoralis major:
(α) Prominent pectoral region
↓ (β) Brawny induration or mass
↓ (γ) Fluctuation
(c) Leucocytosis

Treat: Free incisions with adequate drainage:
(a) Along the lower border of pectoralis
(b) Over the pointing region

After-treat: Carrel-Dakin

Compl: (1) Septicæmia
(2) Femoral thrombo-phlebitis
(3) Secondary hæmorrhage
(4) Sloughing and gangrene

(B) Subscapular abscess:

Etio: (a) Penetrating wounds
(b) Axillary sepsis
(c) Osteomyelitis scapula or rib
(d) Spinal caries

Site: Under the scapula and scapular muscles
↓ Subcutaneous

Clinic: (1) Pronounced toxæmia
(2) Prominent scapula
(3) Fluctuating swelling:
(a) Under the scapula
↓ (b) Subcutaneous

(C) Secondary abscess:

(1) Cold abscess: (a) Spinal
(b) Rib
(c) Sternal
(2) Empyema necessitatis
(3) Peripleuritic abscess
(4) Perforating lung abscess
(5) Mediastinal infected dermoid cyst

(2) FURUNCLES AND CARBUNCLES OF THE CHEST WALL: (See under Skin)

Site: Back: (a) Between and over the shoulder blades
(b) Nape of the neck
(c) Shoulder

(3) GAS GANGRENE OF THE CHEST WALL: (See under Gas Gangrene)

Etio: Punctured or lacerated wounds of the muscles

Clinic: (a) Toxæmia
(b) Œdema, crepitus, mal-odorous discharge

Diff. diag: Surgical emphysema

Treat: (a) Widespread incisions
(b) Oxygenating antiseptics
(c) Anti-gas gangrene serum

(4) ERYSIPELAS OF THE CHEST WALL: (See under Erysipelas)

(5) CELLULITIS OF THE CHEST WALL:

Etio: (1) Trauma
(2) Ascending extravasation of urine

(6) SEPTIC SPREADING GANGRENE OF THE CHEST WALL:

Etio: Drainage of virulent intrathoracic sepsis:
(a) Empyema
(b) Lung abscess

(7) TUBERCULOSIS:

(A) **Lupus**

(B) **Cold abscess:**

Etio: (a) Primary:
(α) No primary focus
(β) Multiple and recurrent cold abscesses in the subcutaneous tissues
(b) **Secondary:**
(α) **Bones:** (i) Sternum
(ii) Ribs
(iii) Spine
(β) **Glands:** (i) Axillary
(ii) Mediastinal
(γ) **Pleura** or pericardium

Path: (a) Deep: submuscular
↓ (b) Superficial
↓ (c) Bursting → sinus

Clinic: (1) Fluctuating, localised, non-inflammat swelling
(2) **Aspiration:** Caseous debris
(3) Primary T. B. focus

Diff. diag: (1) Chronic non-tuberculous abscess
(2) Empyema necessitatis
(3) Lipoma
(4) Suppurating dermoid

Compl: Sinus-formation

Treat: (A) General: antituberculous: heliotherapy
(B) Local:
(a) Carefully aseptic aspiration
(b) Sequestrotomy
(c) **Excision** of the underlying focus:
(α) Bone
(β) Glands

(C) **Subpectoral or axillary adenitis:**
(See under Lymphatics)

Etio: (a) Local predisposition
(b) Spread from cervical glands
(c) General predisposition

Clinic: Diffuse enlargement
↓ Matting
↓ Caseation
↓ Cold abscess formation
↓ Suppuration
↓ Sinus-formation

Treat: (1) General: antituberculous; heliotherapy
(2) Local: (a) Scraping
(b) **Excision**

Varieties of chest wall tuberculosis:

(A) **Pleural:**
(a) Empyema necessitatis
(b) Pleuro-cutaneous sinuses
(c) Post-operative spread

(B) **Endo-thoracic fascial:**
Site: Between pleura and ribs
Diag: X-Ray after lipoidol
Treat: Conservative

(C) **Bony:**
(a) Ribs
(b) Cartilage
(c) Sternum
(d) Periosteum
Treat: Surgical

(D) **Subcutaneous:** Lymph glands

(E) **Cutaneous:** (a) Primary: lupus
(b) Secondary: to deeper foci

(8) SYPHILIS:

(A) **Chancre of the nipple or breast**

(B) **Secondary cutaneous eruptions**

(C) **Gumma:**

Sites: (α) Skin } anywhere
(β) Muscles }

Clinic: (a) **Tumour:**
: Rubbery, elastic, dusky, solitary
↓ (b) **Abscess:**
: Liquifaction + secondary infection
↓ (c) **Ulcer:** Gummatous

Diff. diag: (1) Malignancy
(2) Tuberculosis

Treat: Anti-syphilitic

(9) ACTINOMYCOSIS:

Etio Spread from (a) Jaw or neck
(b) Lung and pleura

Clinic: (a) Chronicity
(b) Induration
(c) **Multiple abscesses and sinuses**

Diag: (a) Sulphur granule discharge
(b) Ray fungus in smear

Treat: (1) Massive doses of **pot. iodide**
(2) Copper sulph. or iodine sol :
(α) Irrigations
(β) Injections
(3) Operative: Scraping or excision

(10) BLASTOMYCOSIS:

Site: Anywhere on the thorax

Path: (1) Cutaneous
(2) Pulmonary → systemic

Clinic: (a) Pustules: multiple, in crops
(b) Subcutaneous abscesses and sinuses
(c) Local ulcerations :
With: **Papillomatous fungoid granulations**

Diag: Blastomycetes in smear

Treat: (1) Excision
or (1) Incisions and drainage
↓ (2) Copper sulph. or iodine irrigations
(3) Radiotherapy
(4) Massive doses of pot. iodide

(B) INFECTIONS OF THE CHONDRIUM AND PERICHONDRIUM:

(1) PYOGENIC CHONDRITIS AND PERICHONDRITIS:

Etio: (a) Trauma
(b) Extension
(c) Pyæmic

Path: (*a*) Perichondrium: stripped off
(*b*) Chondrium: dark, eroded, necrosed

Clinic: (*a*) General signs of inflammation
(*b*) Local signs of inflammation:
(α) Inflammation
↓ (β) Abscess
↓ (γ) Sinus
↓ (δ) Extension to neighbours

(2) TYPHOID CHONDRITIS:

Etio: (*a*) **Men over 30**
(*b*) Convalescent or delayed

Path: Osteitis near costo-chondral junction
↓ Separation of cartilage
↓ Suppuration

Clinic: (*a*) **History of typhoid**
(*b*) Onset: insidious or acute
(*c*) Local signs:
(α) Painful, tender, slow swelling
↓ (β) Fluctuant abscess
↓ (γ) Sinus

Diag: (*a*) Widal
(*b*) Smear

Diff. diag: (*a*) Pyogenic
(*b*) Tuberculous
(*c*) Syphilitic
(*d*) New growth. sarcoma

(3) TUBERCULOUS CHONDRO-PERICHONDRITIS.

Etio: (*a*) Systemic
(*b*) Local extension: from thorax or mediastinum

Path: Origin: cartilage, perichondrium, rib

Clinic: (*a*) Spontaneous or post-traumatic insidious swelling over the costal cartilage
↓ (*b*) Fluctuant cold abscess
↓ (*c*) Discharging sinus

Diff. diag: (1) Chronic pyogenic chondritis
(2) Typhoid chondritis
(3) Syphilitic chondritis

(4) SYPHILITIC CHONDRITIS:

(A) **Secondary osteocopic pains**

(B) **Perichondritis and chondritis:**

Clinic: (1) **Swelling:**
: Spontaneous, slow, fusiform.
: Sterno-costal or costo-chondral

(α) Firm and elastic
↓ (β) Soft and doughy
↓ (γ) Fluctuant
↓ (2) Abscess
↓ (3) Sinus

Diag: **Other signs of syphilis**

(5) ACTINOMYCOTIC AND BLASTOMYCOTIC CHONDRITIS:

Treatment: of perichondritis and chondritis

(1) **Total subperichondral excision:**
: From bony rib to bony sternum
: Whole of the cartilaginous mass

(2) **General anti-treatment:**
(*a*) Pyogenic
(*b*) Tuberculosis
(*c*) Syphilis
(*d*) Typhoid
(*e*) Actinomycosis

(C) INFECTIONS OF THE BONES AND PERIOSTEUM:

Etio: (1) Pyogenic
(2) Tuberculosis
(3) Typhoid
(4) Syphilis
(5) Actinomycosis
(6) Blastomycosis

(1) PYOGENIC PERIOSTITIS AND OSTEOMYELITIS OF THE RIBS AND STERNUM:

Etio: (*a*) Trauma
(*b*) Extension from intra-thoracic lesion
(*c*) Septicæmic

Path: Extension along the rib or sternum

Clinic: (*a*) Swelling: painful and tender
↓ (*b*) Abscess
↓ (*c*) Sinus
(*d*) X-Rays

Treat: (1) Acute stage: incision and drainage
(2) Chronic stage: resection

Compl: (1) Abscess: (*a*) Subcutaneous
(*b*) Extrapleural
(*c*) Mediastinal
(2) **Necrosis rib**
(3) Anterior mediastinitis
(4) Pneumonia

(2) TYPHOID PERIOSTITIS AND OSTEOMYELITIS:

Etio: Convalescent or delayed

Path: Periostitis
Osteoperiostitis
Osteomyelitis
Bone abscess

Clinic: (1) Pain
↓ (2) Slow, small swelling of a rib
↓ (3) Cold abscess
↓ (4) Sinus
(5) History + bradycardia + widal

Course. (1) Acute
(2) Chronic
(3) Recurrent

Treat: (1) General: Typhoid vaccine
(2) Surgical: (*a*) Curettage and drainage
(*b*) Sub-periosteal resection

(3) TUBERCULOSIS OF RIB AND STERNUM:

Etio: Young and middle age

Path: (1) Primary: (*a*) Periostitis
(*b*) Osteomyelitis
(2) Secondary: to intra-thoracic tuberculosis

Clinic. (1) Osteo-sclerosis
↓ (2) Cold abscess: (*a*) Local
(*b*) Gravitating
↓ (3) Secondary infection; signs of inflammation
↓ (4) Sinus
+ (5) X-Rays

Diff. diag: (1) Chronic non-tuberculous osteomyelitis
(2) Typhoid rib
(3) **Syphilis**
(4) Lipoma: from cold abscess

Treat: (1) General: anti-tuberculous
(2) Local: (*a*) Repeated aspirations
(*b*) **Resection**

(4) SYPHILIS

Path: (1) Osteocopic pains
(2) Periostitis
(3) [illegible]
(4) [illegible]

Clinic: (1) [illegible]
or Globular swelling: of: sternum
: sterno-clavicle
(*a*) Elastic and doughy
↓ (*b*) Soft and fluctuant

↓ (2) Secondarily infected inflammatory abscess
↓ (3) Sinus or ulcer
+ (4) X-Rays
+ (5) **Other syphilitic stigmata**

Treat: (1) Anti-syphilitic
(2) Operative:
Ind: (*a*) Extensive necrosis
(*b*) Secondary infection
Tech: (*a*) Incision and drainage
(*b*) Scraping and sequestrotomy
(*c*) Resection

(5) ACTINOMYCOSIS AND BLASTOMYCOSIS OF RIB AND STERNUM:

Path: (*a*) Periostitis
(*b*) Osteomyelitis

Clinic: (See above under soft part infections)

Treat: (1) Massive dosage of pot. iodide
(2) Curettage or excision

(6) XYPHOIDITIS.

Path. Chronic periostitis

Clinic Pain and tenderness

Treat: Excision

(III) RICKETS OF THE CHEST WALL:

(1) **Rickety rosary:**
: Beaded enlargement of costo-chondral junctions

(2) **Pigeon breast:**
: Effect of impeded respiration on thoracic soft bones

(3) **Harrison's sulcus:**
: Traction of the diaphragm on soft ribs

(IV) NEW GROWTHS OF THE CHEST WALL:

(A) TUMOURS OF THE SOFT TISSUES:

(1) **Sebaceous cyst**
(2) **Dermoid cyst:** Mid-line, anterior
(3) **Fibroma:**
(*a*) Keloid
(*b*) Subcutaneous fibroma
(*c*) Neuro-fibroma:
(α) Single
(β) Multiple
(γ) Molluscum fibrosum
(δ) Plexiform neuro-fibroma
(4) **Lipoma:**

Site: Back, shoulder, axilla, retromammary
Compl: Penetration of thoracic wall

(5) **Melanoma:** Pigmented moles

(6) **Lymphangioma:** Superficial or sub-muscular
(7) **Hæmangioma:** Cavernous; telangiectatic
(8) **Carcinoma:** Secondary to breast:
 (*a*) Cancerous pachydermia
 (*b*) Cancer en cuirasse
 (*c*) Cancerous nodules
 (*d*) Paget's disease
(9) **Sarcoma:**
 (*a*) Secondary to breast or bone or **Cartilage**
 (*b*) Primary in fasciæ or muscles

(B) TUMOURS OF THE RIB AND STERNUM:
(1) **Sarcoma:**
Etio: 60%
Path: **Chondro**; osteo; spindle-round-mixed celled
(2) **Carcinoma:**
 (*a*) Infiltrative: from breast
 (*b*) Metastatic
(3) **Chondroma:** 15%
(4) **Osteoma:**
Etio. 2nd to 6th decade
Clinic (1) Pain: (*a*) Local
  (*b*) Neuralgic
 (2) Swelling: attached to a bone
 (3) Skin implication
 (4) X-Rays
Diff. diag: *Of chest wall tumours*
 (A) Bone: Chronic inflammation:
  (α) Pyogenic
  (β) Tuberculous
  (γ) Syphilitic
  (δ) Typhoid
 (B) Aneurysm
 (C) Intra-thoracic tumours extending **outside**
 (D) Dermoid cyst
Treat: Radical excision:
 Ind: Primary tumour without:
  (*a*) Metastases
  (*b*) Cachexia
 Anæsth: (1) Intra-tracheal positive-pressure
  (2) Local
 Tech: Incision
  ↓ Excision of tumour with wide margin
  ↓ **Air-tight closure:**
  By: Muscle, mobilised breast, diaphragm, fascia lata
Post. compl: (*a*) Surgical pneumothorax
 (*b*) Sepsis
 (*c*) Pleural effusion → empyema

(V) DEFORMITIES OF THE CHEST WALL:

(1) NORMAL VARIATIONS:
- (a) **Narrow alar chest**
- (b) **Flat chest**

(2) CONGENITAL: Local prominence of sternum, rib

(3) RICKETY DEFORMITIES:
- (a) **Pigeon chest**
- (b) **Rickety rosary**
- (c) **Harrison's sulcus**

(4) ATTITUDINAL DEFORMITIES:
: **Crumpled chest**
Etio: Faulty attitudes + rickets

(5) SECONDARY DEFORMITIES:
Etio: Intra-thoracic cause
Varieties: (a) **Barrel-shaped chest:**
Etio: Pulmonary emphysema
(b) **Unilateral enlargement:**
Etio: (1) Pleuritic effusion:
. Gas, serum, blood, pus
(2) Intra-thoracic tumour
(c) **Unilateral shrinking:**
Etio: (1) Old pleuritic adhesions
(2) Fibrosis of the lung

(6) SPINAL THORAX:
: Thoracic deformity secondary to that of spine

(VI) OPERATIONS ON THE CHEST WALL:

RESECTION RIB.

Ind: (1) **Empyema**
(2) **Carries rib:**
- (a) Pyococcal
- (b) Tuberculosis
- (c) Typhoid
- (d) Syphilis
- (e) Actinomycosis
- (f) Empyema drainage

(3) **Tumours of the rib:**
- (a) Chondroma
- (b) Osteo-chondroma
- (c) Osteo-chondro-sarcoma

(4) **Access to internal viscera:** Empyema
(5) Wounds of intercostal or int. mammary artery

Tech: (1) Anæsthesia:
(a) **Local: infiltration**

(b) **Regional :** Nerve block
: Paravertebral

(c) General

(2) Incision :

(a) Over and parallel to the rib

or (b) Right angles to the rib :
' If many ribs are to be removed

(3) Periosteal incision

(4) Stripping off the periosteum and intercostal bundle from the rib
: (Doyen's raspatory)

(5) Excision of the required portion of the rib
: (Rib shears)

Points : (1) **Avoid inj. to intercostal vessel and nerve**
(2) **Avoid injury to the underlying pleura**
(3) Do not leave projecting spicules of bone

(For other operations on thoracic wall, see under Respiratory System)

(VII) IMPORTANT POINTS.

(A) **Trauma of the chest wall :**

(1) Continuously painful tender immobile swelling over a rib after direct trauma, with no effect on symptoms, of respiratory movements
: ? Subperiosteal contusion or hæmatoma.

(2) Bony swelling with a history of old trauma :
? Ossified sub-periosteal hæmatoma
? Callus
? Infection : T B., syphilis
? Sarcoma

(3) Direct fracture of the rib is more dangerous than indirect fracture

(4) Adhesive strapping in expiration is indicated only in indirect fracture and is contra-indicated in direct fracture with inward displacement

(5) Dyspnœa and cyanosis after a chest wound :
? Traumatic pneumonia
? Pleural effusion : serum, blood, pus
? Pneumothorax

(6) Do not omit prophylactic anti-pneumonic treatment in every case of chest injury.

(7) Chest injuries must be divided into those with :
(a) Pneumothorax : (α) Closed
(β) Open
(b) No pneumothorax.

(8) First cardinal rule in the treatment of chest injuries is to close any sucking wound of the chest wall immediately.

(9) Bettman's principles in chest injuries treatment:
- (*a*) Immediately close all sucking wounds
- (*b*) Closed pneumothorax with dyspnœa:
  : Aspirate the air
- (*c*) Hæmorrhage from intercostal arteries:
  : Encircle the entire rib above and below with a tight suture
- (*d*) Large lacerations of the lung should be repaired.

(10) Open wounds of the thorax can be divided into two great classes: (*a*) Sucking: do urgent closure
(*b*) Non-sucking

(B) Infections of the chest wall:

(1) Tissues to be infected:
- (*a*) Soft tissues
- (*b*) Chondrium and perichondrium
- (*c*) Bone and periosteum

(2) Infections of the chest wall:
- (*a*) Pyogenic. (α) acute
  (β) chronic
- (*b*) Tuberculosis
- (*c*) Syphilis
- (*d*) Typhoid
- (*e*) Actinomycosis and blastomycosis
- (*f*) Others: (α) Gas gangrene
  (β) Erysipelas
  (γ) Cellulitis
  (δ) Septic gangrene

(3) Clinical stages of the chest wall infections:
- (*a*) Pain and tenderness
- ↓ (*b*) Swelling (α) Hard. bone or cartilage
  (β) Soft. soft tissues
- ↓ (*c*) Cold abscess: non-inflammatory
- ↓ (*d*) Subacute or acute abscess
- ↓ (*e*) Sinus

(4) Additional examination in the chest wall infections:
- ? Tuberculous diathesis or focus elsewhere
- ? Syphilitic history or stigmata
- ? Typhoid history

(5) Common infections observed elsewhere are but rarely observed in the soft parts of the thoracic wall, due to absence of exposure and trauma.

(6) Cold abscess in the thoracic wall:
- ? Rib or cartilage
- ? Sternum
- ? Spine
- ? Scapula
- ? Lymph glands
- ? Empyema necessitatis

(7) Typhoid is the commonest of the hæmatogenous forms of infection involving the costal cartilages and the ribs.

(8) Always suspect tuberculosis, when a chronic inflammatory lesion appears spontaneously over a costal cartilage or rib.

(9) Procedures adequate for localised infections in the bone do not suffice for chondritis. Incision and scraping of the chondrium is followed by extension of the disease Radical excision is the only effective treatment of chondral infections. Care must be taken to excise the whole mass of cartilage from bone to bone and to leave no portion of cartilage behind.

(10) Tuberculosis of the chest wall:
  (1) Pleural tuberculosis
  (2) Endothoracic fascial tuberculosis
  (3) Bony tuberculosis:
    (*a*) Rib
    (*b*) Cartilage
    (*c*) Sternum
    (*d*) Periosteum
    (*e*) Spine

(C) New growths of the chest wall:

(1) Lipoma, melanoma and carcinoma are the commonest tumours of the soft tissues of the thoracic wall.

(2) Sarcoma is the commonest tumour of the bony thorax; next is chondroma, followed by secondary carcinoma.

(3) Growths of the chest wall can be differentiated into:
  (*a*) Innocent: lipoma, neuro-fibroma
  (*b*) Innocent → malignant:
  : Chondroma, melanoma
  (*c*) Malignant: sarcoma, carcinoma

(4) Carcinoma is the commonest tumour of the chest wall to be met with, as carcinoma of the breast is very common.

(5) Greatest number of metastatic tumours in bony thorax are due to breast carcinoma.

(6) Neoplasm of the rib or sternum in a patient with syphilis may decrease in size after antisyphilitic treatment.

(D) Rib operation: excision

(1) Beware of premature or unnecessary injury to the pleura.

(2) Too long a drainage by rubber tube leads to necrosis of a rib

(3) Spreading gangrene of the thoracic wall is sometimes a complication of the drainage of a virulent intra-thoracic sepsis.

(4) Air-tight closure of the thoracic wound is a matter of first importance in cases in which the pleura has been opened.

(5) Anti-pneumonic prophylaxis is of paramount importance in every case of trauma to or operation on the thorax.

(E) Differential diagnosis of chest wall affections:

(a) Pain & tenderness:

(1) Soft tissue inflammations

(2) Muscular.
- (α) Myalgia } rheumatic
- (β) Pleurodynia } rheumatic
- (γ) Stitch: overstrain

(3) Nervous.
- (α) Neuralgia: intercostal
- (β) Herpes zoster
- (γ) Secondary: spinal disease or traun
  aneurysm
  new growth pressure
- (δ) Central: tabetic crisis

(4) Bony affections.
- (α) Trauma: contusion
  fracture
- (β) Inflammations
- (γ) New growths

(5) Visceral: pleurisy
heart disease: angina
flatulence

(b) Swelling:

(1) Skin and subcutaneous tissues
- (α) Trauma: contusion, hæmatoma
- (β) Inflammations: acute abscess
  spreading cellulitı
  cold abscess
  gumma
  actinomycosis
- (γ) New growths: lipoma
  fibroma, neuro-fib
  carcinoma, sarcon

(2) Bones and cartilages:
- (α) Trauma: contusion, fracture, cal

(β) Inflammations: pyogenic
tuberculous
typhoid
syphilis
actinomycosis

(γ) New growths: chondroma
osteoma
sarcoma
secondary carcinoma

(δ) Metabolic: rickety rosary

(3) Secondary to visceral affections:

(α) Intra-thoracic effusions
(β) Enlarged liver
(γ) Aneurysm
(δ) Intra-thoracic tumours

(4) Secondary to deformity:

(α) Congenital prominence
(β) Rickety chest
(γ) Spinal chest.

CHAPTER VI

THE BREAST

(A) AFFECTIONS OF THE NIPPLE:

(1) CONGENITAL AFFECTIONS OF THE NIPPLE:

(A) **Absence of the nipple**

(B) **Supernumerary nipples:**

Etio: Males

Site: Axilla → groin

(C) **Retraction of the nipple:** Incomplete evolution

(2) RETRACTION OF THE NIPPLE:

Etio: (*a*) **Congenital**

(*b*) **Fibrosis:** Post-inflammatory; malignancy

(*c*) **Infiltration:** Malignancy

Compl: Milk congestion

↓ Acute mastitis

↓ Mammary abscess

(3) CRACKS OF THE NIPPLE:

Etio: Neglect in pregnancy and lactation

Clinic: (*a*) Intense pain and burning

(*b*) Serous discharge

Compl: (*a*) **Mastitis:**

(α) Streptococcal cellulitis

(β) Ductal

(*b*) Axillary adenitis

Treat: (*a*) **Prophylactic: Hardening with spirit**

(*b*) Curative:

(α) Dressings: dry; silver nitrate

(β) Artificial emptying of the breast

(4) CHANCRE OF THE NIPPLE:

Etio: (*a*) Suckling child:

: Colles's law: wet nurse; not mother

(*b*) Opposite sex

Clinic: (*a*) **Local: Indolent** (α) **Fissure**

(β) **Induration**

(γ) **Ulcer**

(*b*) **Regional:** Hard and shotty axillary glands

(*c*) **General:** Secondary rash

: Other syphilitic stigmata

(5) ECZEMA OF THE NIPPLES:

Etio: Moisture

Clinic: (a) **Bilateral**
(b) Lactational
(c) Amenable to treatment

Diff. diag: (1) Crack
(2) Chancre
(3) **Paget's disease**

Compl: (a) Cracks
(b) Lymphangitis → lymphadenitis
(c) **Mastitis** → mammary abscess

Treat: (1) Local: ointments, antivirus applications
(2) General: vaccine

(6) PAGET'S DISEASE OF THE NIPPLE:

Def. **Unilateral, chronic, intractable, eczema-like affection which co-exists with or is followed by carcinoma breast**

Path: (A) Theories:
(1) **Handley's post-cancer theory:** Lymphatic obstruction
(2) **Cheatle's cancer theory:** Carcinoma of duct outlet
(3) **Turnbull's cancer theory:** Basal-celled skin carcinoma
(4) **Muir's precancer theory:** Intra-ductal epithelial proliferation

(B) Morb. anat:
(1) Proliferation of the epidermis
(2) Paget's cells: large and clear
(3) Lymphocytes and plasma cells
(4) Epithelial hyperplasia in the breast

Clinic: (a) Florid, red eruption
↓ (b) Moist, chronic eczema
↓ (c) Dry, psoriasis-like patches:
with (α) Sharply defined margins
+ (β) Papyraceous induration
+ (γ) Eroded nipple

Diagnosis: (1) Menopause
(2) **Unilateral**
(3) Intractable
(4) Associated carcinoma breast

Diff. diag: (a) Cracks
(b) **Eczema**
(c) Chancre

Treat: **Radical removal** of the breast as soon as diagnosis is established

(7) NEW GROWTHS OF THE NIPPLE:

(A) **Papilloma:**

Clinic: Pedunculated, globular, warty

Compl: Ulceration

Treat: Excision

(B) **Carcinoma:**

Varieties: (1) Squamous: skin
(2) Spheroidal: sebaceous
(3) ? Basal-celled: Paget's disease

(8) ABNORMAL NIPPLE DISCHARGES:

Varieties. (A) **Milky:**
(*a*) Latent lactation
(*b*) Galactocele

(B) **Purulent:**
(*a*) Acute mammary abscess
(*b*) Chronic mammary abscess

(C) **Serous or sero-sanguinous:**
(1) **Chronic interstitial mastitis**
(2) **Chronic duct catarrh**
(3) Duct papilloma
(4) Duct carcinoma

(D) **Blood:**
(1) **Duct papilloma**
(2) **Duct carcinoma**
(3) Chronic duct catarrh

(E) **Green:**
(1) Chronic duct catarrh
(2) Chronic interstitial mastitis with polycystoma

Treat:

(A) Discharging nipple **without a palpable mass:**
: **Local excision** of the ducts

(B) Discharging nipple **with a suspicious mass:**
: (*a*) **Amputation** of the breast
↓ (*b*) Biopsy

(C) Discharging nipple **with carcinomatous mass:**
: **Radical** removal

(9) MONTGOMERY'S CYST: Areolar sebaceous cyst

(B) AFFECTIONS OF THE BREAST:

(I) CONGENITAL BREAST ABNORMALITIES:

(1) AMAZIA OR AMASTIA:

Def: Absence of the breast

Associated: Absence of sternal part of pectoralis

(2) POLYMAZIA OR POLYMASTIA:

Def: Accessory breasts

Clinic: Additional breast lying in line from axilla to umbilicus, groin or thigh

(3) GYNÆCOMAZIA OR GYNÆCOMASTIA:

Def: **Male breast resembling that of virgin female**

Etio: Adolescence

Path: (a) Development of ducts and supporting tissue
(b) Pseudo-lactation: in rare cases

Clinic: Female configuration of a male breast

Compl: (a) Psychic effect
(b) Mastitis

Treat: Excision: with preservation of areola and nipple

(II) INJURIES OF THE BREAST:

(1) CONTUSION AND HÆMATOMA:

Etio. Direct injury; operative trauma

Clinic: (1) Lump with or without overlying contusion
(2) *History of injury or recent operation*

Compl. (a) Sepsis
(b) **Fat necrosis**
(c) Malignancy

(2) MILK FISTULA.

Etio: Penetrating wound / Operative incision } across a milk duct

(3) TRAUMATIC FAT NECROSIS.

Etio: *History of contusion or hæmatoma in stout breast*

Path: Slow **aseptic saponification** of neutral fat
Morb. anat: Chalky-white areas
Microscope: Necrotic fat
: Vacuolated cells
: Giant cells

Clinic: (1) History of previous injury
(2) **Lump**: Painless, hard, well-defined, adherent
(3) Retraction of nipple: in 20%
(4) *Peau d' orange: sometimes*

Diag: Persistent adherent **lump following trauma** in a stout middle-aged female

Diff. diag: (1) Hæmatoma
(2) **Carcinoma**
(3) Tubercle or gumma
(4) Any other tumour

Treat: Local excision → biopsy

(III) INFLAMMATIONS OF THE BREAST:

(1) MASTITIS NEONATORUM:

Etio: (*a*) Hormonic: maternal
(*b*) Retrograde bacterial infection of the ducts

Clinic: Mastitis within a few days of birth

Treat: Expectant and non-interfering

(2) MASTITIS ADOLESCENTIUM:

Clinic: Unilateral mastitis in a boy about 14

Treat: **Expectant:**
(*a*) Sling
(*b*) Scott's ointment
(*c*) Mist. pot. iodide

(3) MASTITIS OF LACTATION:

Etio: (*a*) Child birth with inability to suckle:
due to: (α) Maternal defect
(β) Child defect
(*b*) Portal of sepsis entry: cracks of the nipple

Path: (A) **Ductal mastitis: Obstruction mastitis**
(*a*) Ductal obstruction
↓ (*b*) Milk engorgement
↓ (*c*) Staphylococcal mastitis
(B) **Lymphangitic mastitis: Abrasion mastitis**
(*a*) Cracks of the nipple
↓ (*b*) Lymphangitis
↓ (*c*) Streptococcal mastitis

Clinic: (1) **Stage of engorgement or lymphangitis**
(A) Local:
(*a*) Engorgement:
(α) Some cause of milk retention
(β) Acute engorgement of breast with **cord-like ducts** converging on the nipple
(*b*) Lymphangitis:
(α) Cracks of the nipple
(β) Superficial inflammation with **red streaks**
(B) Regional:
: Tender enlargement of axillary glands
(C) General: toxæmia
(2) **Stage of acute mastitis:**
(*a*) Acutely inflammed breast with spreading œdema and induration
(*b*) Acute axillary lymphadenitis
(*c*) Acute general toxæmia

Diff. diag: **Mastitis carcinomatosa**

Compl: (1) Acute, subacute or chronic **breast abscess**
(2) Subacute or chronic mastitis

Treat: (A) **Preventive:**
(*a*) **Before lactation:**
: **Preparation of the nipple:**
(α) Mechanical: prominence
(β) Hardening: spirit
(Υ) Care of abrasions
(*b*) **Lactation:**
(α) **Asepsis of the nipple:** Dry cleaning
(β) Asepsis of the child's mouth
(*c*) **Weaning:**
: **Treatment of milk engorgement:**
(1) Judicious breast-pump
(2) Glycerine-belladonna
(3) Sling
(4) Dehydration · saline purges
(5) Atropine and pot. iodide

(B) **Curative:**
(1) Treatment of milk engorgement
(2) Bier's hyperæmia
· By suction pump for 45 min daily
(3) Sulphonamide therapy
(4) Vaccines

(4) SUBACUTE OR CHRONIC REGIONAL MASTITIS:

Etio. (*a*) **Local irritation:** Ill-adjusted braces
(*b*) **Secondary** to acute mastitis:
(α) Infantile
(β) Adolescent
(Υ) Lactational
(*c*) **Specific:** T. B., syphilis

Clinic: (1) Subacute or chronic, tender induration which neither liquifies nor resolves
(2) Axillary lymphadenitis
(3) Mild general toxæmia

Diff. diag · (1) Hæmatoma
(2) Fat necrosis
(3) **Carcinoma**
(4) Chronic abscess
(5) Chronic interstitial mastitis
(6) Fibro-adenoma
(7) Specific diseases: T. B.; gumma

Compl: Breast abscess

Treat: (1) **Local:**
(*a*) Counter-irritants: Scott's ointment
(*b*) Heat & Bier's hyperæmia
(*c*) **Multiple needlings**
↓ Fomentations and Bier's hyperæmia
(2) **General:**
(*a*) Sulphonamide therapy
(*b*) Vaccines
(*c*) Pot. iodide, fibrolysin

(5) ACUTE ABSCESS OF THE BREAST:

(I) **Intra-mammary abscess:**

Etio: (*a*) **Milk obstruction:** Obstruction mastitis
(*b*) **Nipple abrasions:** Abrasion mastitis

Path: (*a*) Continuation of acute lactational mastitis
↓ (*b*) Localising abscess in the mammary tissue
↓ (*c*) Bursting
↓ (*d*) Sinuses

Clinic: (A) **Local:**
(1) Continuation of acute lactational mastitis
↓ (2) **Localised induration:** Inflammatory
: Painful, tender, œdematous, red
↓ (3) Localised **fluctuation:** Inflammatory
↓ (4) Pointing of the abscess
↓ (5) Bursting
↓ (6) Sinus
(B) **Regional:**
. Axillary lymphadenitis
(C) **General:**
. Hectic high temperature
(D) **Special:**
: Leucocytosis

Diff. diag: **Mastitis Carcinomatosa**

Compl: Milk fistula

Treat: (1) **Aspiration:** Under local anæsthesia (Med. Ann. 1937)
↓ Dakin's lavage
Ind: (*a*) Abscess in a non-lactating breast
(*b*) Localised, unilocular abscess
(2) **Incision and drainage:**
Tech: (A) **Local method:**
(*a*) **Incision:**
: Radiating from the nipple
: Over the most prominent part
↓ (*b*) **Breaking down all septs**

↓ (c) Counter-incision:
: Over the dependant part
↓ (d) Drainage
(B) **Sheild's method:**
(a) Infra-mammary drainage
+(b) Suture of upper incision
(C) **Bailey' method:**
(a) Small incision: ¾ inch
+(b) Closed drainage

Post. treat: (A) **Local:**
(1) **Open drainage** method
or (2) **Closed drainage** method: (Bailey & Love)
with: (a) Dakin's irrigations
(b) Vaseline or oily skin dressings
(B) **Regional:**
(3) Treatment of milk engorgement:
: Breast pump
(4) Supporting bandage and **arm sling**
(C) **General:** Sulphonamide group
Vaccines

(II) Supra-mammary or sub-areolar abscess:

Etio: Skin lesion
Clinic: Subcutaneous abscess
Treat: Incision and drainage: local, radiating

(III) Sub-mammary abscess:

Etio: (1) **Muscle** lesions:
: Deep intra-muscular } abscess
: Sub-muscular glandular } abscess
(2) **Bone** lesions: osteomyelitis ribs
(3) **Thorax** lesions: empyema necessitatis
Clinic. (1) Unilateral prominence of the breast as a whole
(2) Fluctuating swelling:
(a) Behind the breast
(b) Felt at its margins
(3) Presence or absence of acute inflammation
Compl: Chronic sinus
Treat: (1) Incision and drainage:
Site: Infra-mammary sulcus
: Lower and outer quadrant
↓ (2) Treatment of underlying etiology

(6) CHRONIC STAPHYLOCOCCIC ABSCESS:

Etio: Infection by mild staphylococci

Path: Encysted, chronic, localised, staphylococcal abscess
Clinic: (a) Local, hard, non-inflammatory swelling
(b) Enlargement of axillary glands
(c) Peau d' orange: sometimes
Diag: **Tenderness of the mass and glands**
Diff. diag: (a) **Carcinoma**
(b) **Gumma**
(c) Tuberculosis
(d) Fat necrosis
(e) Localised chronic mastitis
Treat: (1) Local:
(a) **Aspiration:** Repeated if necessary
(b) Incision and drainage
(c) Exploration and excision in toto
(2) General:
(a) Vaccines
(b) Stanno-manganese
(c) Sulphonamide therapy

(IV) SPECIFIC DISEASES OF THE BREAST:

(1) TUBERCULOSIS OF THE BREAST:

Etio: Age: 25 → 35
Varieties: (1) Primary
(2) **Secondary** To neighbouring foci
(a) Axillary glands
(b) Bones
(c) T. B. empyema
Path: (a) Paths of infection:
(1) Ducts
(2) Surface wounds
(3) Blood stream
(4) Lymphatics: cervical glands
↓ axillary glands
↓ breast
(5) Contiguity of structures
Clinic:
(A) **Primary breast tuberculosis:**
Varieties: (1) **Nodular:**
(a) Irregular lumps
↓ (b) Central caseations
↓ (c) Tuberculous sinuses
(2) **Sclerosing:**
: Hard, shrunken, adherent mass: with
(a) Nipple retraction
(b) Peau d' orange

(3) **Confluent:**
(a) Soft, boggy mass
↓ (b) Ulceration

Diagnosis: (1) Tender **indurations:** One or more
(2) **Fibrosis:** Retraction of nipple, adhesions
(3) **Lymph stasis:** Peau d' orange
(4) **Cold abscesses**
(5) **Sinuses:** With pale granulations
(6) Enlargement of **axillary glands**

Diff. diag: Of any chronic lump in breast
(1) Fat necrosis
(2) Chronic abscess
(3) Gumma
(4) Carcinoma
(5) Chronic mastitis

(B) **Secondary breast tuberculosis:**
↓ **Retromammary cold abscess:** Due to
(a) Ribs
(b) Sternum
(c) Spine
(d) Thorax: tuberculous empyema
(e) Axillary glands

Compl: (Of T. B. breast)
(1) Phthisis
(2) Lardaceous disease

Treat: (1) Conservative:
(a) General anti-tuberculous
(b) Local: counter irritants
Bier
rest
(2) Operative:
(a) Aspiration: of cold abscess
(b) Scraping
(c) Excision
(d) Partial resection: of breast
(e) Amputation breast

(2) SYPHILIS OF THE BREAST.
(A) **Chancre of the nipple:** (See under Nipple)
(B) **Gumma of the breast:**

Clinic: (1) **Tumour:**
: Painless, palpable, hard, movable but fixed in the breast tissue:
(a) Deep
↓ (b) Adherent to the skin, which is:
(α) Normal
or (β) Peau d' orange

↓ (2) **Liquifaction** and softening
↓ (3) **Abscess** formation : secondary infection
↓ (4) Gummatous **ulcer**

Diff. diag : Other chronic affections of the breast
Treat : (1) Pot. iodide
(2) Anti-syphilitic

(C) **Secondary syphilis of the breast :**
(*a*) Mucous patches : in submammary folds
(*b*) Diffuse bilateral mastitis

(3) ACTINOMYCOSIS OF THE BREAST :

Clinic : (*a*) Multiple indurations
↓ (*b*) Softenings
↓ (*c*) Sinuses with sulphur granule discharge
Treat : (See under Actinomycosis)

(4) ELEPHANTIASIS OF THE BREAST :

Clinic : (1) Enormous and uniform swelling of the skin and subcutaneous tissues : with
(*a*) Peau d' orange
(*b*) Lymphorrhea
(2) Recurrent attacks of streptococcal lymphangitis
(3) Recurrent lymphatic fever

Diff. diag : Malignancy
Treat : Amputation breast

(V) CHRONIC HYPERPLASIAS OF THE BREAST :

(1) MEGALOMAZIA OR MEGALOMASTIA :

Def : Bilateral diffuse hypertrophy of the breasts
Etio : (*a*) Adolescence
(*b*) Pregnancy
(*c*) Lactation
Path : Pituitary or ovarian dysfunction (?)
↓ Diffuse fibrous hypertrophy
Clinic : (*a*) Enormous enlargement of both breasts :
↓ (α) Weight
(β) Pressure
(γ) Deformity
(*b*) Association with :
(α) Amenorrhœa
(β) Reproductive anomalies
Treat : Amputation of the breasts

(2) CHRONIC INTERSTITIAL MASTITIS :

Synonyms : '*Maladie kystique of Schimmelbusch*'
'*Mazoplasia of Cheatle*'

Def : A morbid deviation from the normal physiological processes of evolution and involution which correspond with the sexual crises, ... **diffuse fibrosis and epithelial** ...

Etio: (*a*) Unmarried
(*b*) Childless
(*c*) Menopause

Path: (1) *Theories:*
(A) **Perversion of physiological stimulus:**
: Ovaries and corpus luteum
(B) **Chronic irritation:** ← Retained secretion
(C) **Persistent lymph-œdema:**
: *Sampson Handley*

(2) *Morb changes:*
(A) Peri-acinar and periductal fibrosis
(B) Acinar and ductal epithelial proliferation:
(α) Desquamative: chronic duct catarrh
(β) *Intra-ductal papillomata*
(γ) Solid epithelial hyperplasia
(C) Acinar and ductal cystic dilatation

(3) *Varieties:*
(A) **Hypertrophic:** Cellular + epithelial
(B) **Atrophic:** Fibrotic
(C) **Cystic**
(1) Local: Secondary to duct obstruction: due to:
(*a*) Duct papilloma
(*b*) Duct carcinoma
(*c*) Fibro-adenoma
(*d*) Fibrosis
(2) Diffuse

Clinic: (1) Local:
(*a*) Mastodynia
(*b*) **Serous discharge** from the nipple
(*c*) **Granular induration:**
(α) **Sector-shaped**
(β) Diffuse
(γ) *Multiple (each sector-shaped)*
(δ) **Felt laterally but not against the thoracic wall**
(*d*) Cyst or cysts
(*e*) **Absence of fibrous contractions:**
(α) Deviations
(β) Retractions
(γ) Adhesions

(2) Regional:
: Axillary glands: enlarged, fleshy, tender

Diag: (1) Sector-shape
(2) Anatomical boundaries
(3) **Impalpable against thorax**
(4) **No fibrous contractions**

Diff. diag: Is it primary?
Is it secondary?: to ductal obstruction
(1) Fat necrosis
(2) Chronic septic mastitis
(3) Chronic specific mastitis
(4) New growths: benign and malignant

Compl: (1) **Cystic degeneration:** Polycystoma
(2) Fibro-adenoma
(3) ? Carcinoma: 2 %;
: **Turnbull's table:**
(a) Chronic interstitial mastitis
↓ (b) Adenomatous hyperplasia
↓ (c) Carcinomatous hyperplasia
↓ (d) Carcinomatous infiltration

Treat: (1) **Conservative:**
(A) Internal medications:
(a) **Hormone treatment:**
(α) Testosterone acetate injections
(β) Theelin 2 c.cs.: daily injections
(γ) Ovarian residue tablets 5 grs.
(b) Pot. iodide
(B) External applications:
: Glycerine-belladonna
Scott's ointment
(C) Prophylactic **X-Ray exposures**
(D) Aspiration of cysts
\+ Injections of 10 min. of 5 % protargol
↓ Excision:
if (a) Contents bloody
(b) Rapid recurrence
(c) Dense cyst wall
(2) **Operative: amputation breast**
Ind: (a) Many cysts
(b) **Suspected malignancy**
(c) Age over 50
(d) Failure of conservative treatment

(3) CHRONIC DUCT CATARRH:

Path: Benign desquamative hyperplasia of the duct epithelium

Clinic: (1) Serous or bloodstained nipple-discharge
(2) Retraction of a duct-orifice with **white-plug**
(3) **Cord-ducts**
(4) Sector-indurations

Compl: (1) Duct papilloma:
(a) Local
(b) Diffuse papillomatosis

(2) Duct carcinoma:
 (a) Local
 (b) Multicentric
(3) Chronic interstitial mastitis

Treat: (1) X-Ray exposures
 (2) Radium
 (3) Amputation breast

(VI) TUMOURS OF THE BREAST:

Classification:

Path: (A) **Innocent tumours:**
- (a) Epithelial:
  - (1) **Duct papilloma**
  - (2) **Pure adenoma**
- (b) Connective tissue:
  - (1) **Fibroma**
  - (2) **Lipoma**
  - (3) **Myxoma**
- (c) Combined:
  - : **Fibro-adenoma:**
    - (α) Hard
    - (β) Soft
    - (γ) Cystic

(B) **Malignant tumours:**
- (a) Epithelial.
  - : **Carcinoma:**
    - (α) Spheroidal: acinar
    - (β) Columnar: duct
    - (γ) Basal. skin
- (b) Connective tissue:
  - : **Sarcoma:** Round, spindle, mixed, chondro

Morb. anat. (A) **Epithelial tumours:**
- (a) Innocent.
  - (1) Duct papilloma
  - (2) Pure adenoma
- (b) Malignant:
  - Carcinoma

(B) **Connective tissue tumours:**
- (a) Innocent.
  - (1) Fibro-adenoma
  - (2) Fibroma
  - (3) Lipoma
  - (4) Myxoma
- (b) Malignant.
  - Sarcoma

Path: **The epithelium in a duct or acinus, grows:**

(A) **Outwards:** Away from the lumen
- (a) Imitating normal gland tissues:
  - : Adenoma

(b) Disorderly:
(α) In a tubular manner:
: Adeno-carcinoma
(β) Diffusely infiltrating:
: (1) Acinar carcinoma
(2) Duct carcinoma

(B) **Inwards:** Into the lumen
(a) Regularly organised:
: Duct papilloma
(b) Disorderly infiltrating:
: Duct carcinoma

(1) FIBRO-ADENOMA OF THE BREAST:

Def: A new growth consisting of an **encapsuled mass of fibrous tissue containing tubes or spaces lined by epithelium** and arising from periductal tissues.

(A) HARD FIBRO-ADENOMA:

Synonym: Peri-canalicular fibro-adenoma

Etio: Puberty to 30; pregnancy

Path: Epithelial tubes surrounded by concentrically arranged fibrous tissue

Clinic: **Lump** in the breast:
: **Firm**, elastic, mobile, encapsuled, palpable against the thorax, discrete, **slow growing**

Diff. diag: (a) Tense cyst or chronic abscess
(b) Carcinoma
(c) Fat necrosis
(d) Sarcoma
(e) Gumma

Treat: Excision: Gaillard Thomas method

(B) SOFT FIBRO-ADENOMA:

Synonym: Intra-canalicular fibro-adenoma

Etio: age: 30 to 50

Path: Convoluted and infolded, complicated anastomosing masses of richly cellular fibrous tissue lined by epithelium, projecting and filling the ductal lumen.

Clinic: **Lump** in the breast: as in (A), except:
(a) **Rapid growth**
(b) **Soft consistency**
(c) Large irregular size
(d) No fibrous contraction signs

Diff. diag.: (1) Encephaloid carcinoma
(2) Sarcoma
(3) Hypertrophy

Treat: Amputation breast

(C) CYSTIC FIBRO-ADENOMA:

Synonym: Cystadenoma
Sero-cystic disease of Brodie

Def: A soft fibro-adenoma with multiple cysts

Path: (*a*) Soft fibro-adenoma
+(*b*) Multiple cysts: due to
(α) Collection of fluid in epithelial spaces
+(β) Mucoid degeneration of fibrous stroma

Clinic: **Lump** in the breast as in (*B*)
+(*a*) **Multilobular**
(*b*) **Fluctuating areas**

Diff. diag: (1) Chronic cystic mastitis
(2) Cystic duct papilloma
(3) *Cystic* sarcoma
(4) Mucoid or colloid carcinoma

Compl: Ulceration and fungation

Treat: Amputation breast

(D) FUNGATING CYSTIC FIBRO-ADENOMA:

Synonym: Fungating cystadenoma

Path: Ulceration and fungation of fibro-adenomatous tissue

Clinic: (1) Cystic fibro-adenoma
↓ (2) Ulceration
↓ (3) Fungation of lobulated and foliated fibro-adenomatous tissue

Compl: Infection
↓ Inflammation
↓ Ulceration
↓ Hæmorrhage

Diff. diag: (1) Encephaloid carcinoma
(2) Gumma
(3) Fungating sarcoma

Treat: Amputation breast

(E) PURE ADENOMA.

Etio: Very rare
Puberty → menopause

Path: Normal acini: with (*a*) **No ducts**
(*b*) Minimum supporting tiss.
(*c*) **No Fat**

Clinic: Lump: soft, discrete, mobile, *encapsuled*

Treat: (1) Enucleation
(2) Excision
(3) Amputation breast

Secondary changes in fibro-adenoma:

(1) Rapid growth: in pregnancy
(2) Hyaline degeneration } in lactation
(3) Mucoid degeneration }

(4) Cyst formation: in lactation
(5) **Malignant metaplasia:**
(*a*) Carcinoma : from epithelial part
(*b*) Sarcoma: from mesothelial part

(2) PAPILLOMATA OF THE BREAST:

(A) PAPILLOMA OF THE NIPPLE:
(See under Nipple)

(B) DUCT PAPILLOMA:

Def: **An epithelial tumour** arising from the lining cells of a large duct and projecting inwards into the lumen **of the duct giving rise to:**
(*a*) **Blood-stained nipple-discharge**
(*b*) **Sub-areolar local swelling**
(*c*) **Proximal sector-mastitis**
and sometimes degenerating into duct carcinoma

Etio: Menopause

Path: Papillary growth:
(*a*) Consisting of vascular branching cores of delicate connective tissue covered by hyperplastic columnar epithelium
and (*b*) Projecting into the lumen of a dilated duct from its wall

Clinic: (1) Intermittent blood-stained or serous nipple-discharge
↓ (2) Vaguely indurated and granular sector of the breast
↓ (3) Sub-areolar small firm tumour
or (3) Sub-areolar fluctuating cyst:
: Cystic duct papilloma
or (3) Sub-areolar fungating papillomatous masses:
: Fungating papillary cyst-adenoma

Diff. diag: From any cyst, tumour or lump of the breast

Compl: (1) **Duct carcinoma**
(2) **Chronic interstitial mastitis**

Treat: (1) **Amputation breast**
(2) Radium

(C) INTRA-CYSTIC PAPILLOMATA:

Etio: (1) Chronic cystic mastitis
(2) **Cyst-adenoma**
(3) Cystic duct papilloma

Path: Papillomatous growths from the surface epithelium of the wall of a cyst

Clinic: (1) Change from serous to blood-stained nipple-discharge
(2) **Fungation**
(3) **Biopsy:** After excision of etiology

Diff. diag : **Carcinoma**

Compl : (1) Fungation → ulceration → hæmorrhage
(2) Malignant metaplasia : Reclus' disease

Treat. (1) Amputation breast
(2) Radium

(3) CARCINOMA OF THE BREAST :

Def · **Entrance of mammary epithelium into the tissue spaces** through the basement membrane and its unbridled proliferative infiltration of them.

Etio : Frequency : 1 in 3 of female cancers
Age : Menopause

Sites : (*a*) Upper and outer quadrant
(*b*) Nipple

Factors : (*a*) **Dysfunction :** Lack of lactation
(*b*) **Trauma :** Chronic irritation
(*c*) **Evolutional hyperplasias :**
(1) Chronic interstitial mastitis
(2) Chronic duct catarrh
(*d*) **Benign tumours :**
(1) Fibro-adenoma
(2) Duct papilloma
(3) Intra-cystic papilloma

Path. (1) *Origin :*
(A) **Alveolar or acinar :** Spheroidal
(B) **Duct :** Columnar
(C) **Skin** of the nipple :
(*a*) Basal-celled
(*b*) Squamous

(2) *Classification :*
There is a regular tug of war between .

Epithelial proliferation vs. Tissue fibrosis

Epithelium :	Fibrosis	Condition
+ + + +	o	Mastitis Carcinomatosa
+ + +	+	Encephaloid
+ +	+ +	Pseudo-fibro-adenomatous
+	+ + +	Scirrhus
Trace	+ + + +	Atrophic scirrhus

(A) **Spheroidal :** From alveoli
(1) **Mastitis Carcinomatosa :** 2%
(2) **Encephaloid :** 16%
(3) **Scirrhus :** 60%
(4) **Atrophic Scirrhus :** 5%
(5) **Colloid Carcinoma :** 1%

(B) **Columnar:** From: (*a*) Ducts
(*b*) Intra-cystic

(1) **Duct carcinoma:** 8%
(*a*) Single
(*b*) Multicentric

(2) **Intra-cystic carcinoma:** 2%

(3) **Adeno-carcinoma**

(C) **Basal-celled:** From nipple
: **Paget's disease:** 5%

(D) **Squamous:** From skin

(3) *Dissemination of breast carcinoma:*

(I) *Methods:*

(A) **Infiltration:**
: Direct molecular attack and replacement in the tissue spaces

(B) **Permeation:** Lymphatic
: Continuous multiplication along a tube, with or against the current

(C) **Embolism:**
(*a*) **Lymphatic:**
(*b*) **Blood:**
Malignant embolus cut and carried away by the current of the fluid circulating, and its arrest at some distant place, which becomes the scene of activity.

(D) **Trans-cælomic implantation:**
: Implantation on a lower surface, after falling down to it through the space of an internal cavity, by the gravity.

(E) **Propulsion:** Very rare
? Multicentric carcinoma

(II) *Tissues affected:*

Local: (1) **Breast:**
(*a*) Glandular tissue:
Via: (α) Infiltration
(β) Milk ducts
(γ) Lymphatics
(*b*) Pectoral muscle ← pectoral fascia
(*c*) Skin: (α) Cancer *en cuirasse*
(β) Secondary nodules
(γ) Malignant ulceration

(2) **Lymph glands:**
(*a*) Axillary: (α) Permeation
(β) Lymphatic embolism

(b) Parasternal: (α) Permeation
(β) Lymphatic embolism
(c) Supra-clavicular: (α) Primarily
(β) Secondary to (b)
(3) **Bony thoracic wall:** Infiltration

Distant: (1) **Abdomen:**
Tissues: (a) Peritoneum
(b) Liver
(c) Omentum
(d) Ovaries
(e) Pelvis
Methods: (A) **Epigastric invasion:**
(a) Breast
↓ (b) Epigastric rectus sheath
↓ (c) Linea alba
↓ (d) Extra-peritoneal tissue
↓ (e) Peritoneum
(B) **Retro-peritoneal invasion:**
(a) Breast
↓ (b) Pleura
↓ (c) Diaphragm: posterior
↓ (d) Peritoneum
(C) **Diaphrenic invasion:**
. Through anterior diaphragm

(2) **Thorax:**
Tissues: (a) Mediastinal glands
(b) Pleura
(c) Lungs
Methods:
(A) **Lymphatic invasion:**
(a) Parasternal glands
↓ (b) Anterior mediastinal glands
↓ (c) Thoracic glands
(B) ***Chest-wall infiltration:***
(a) Intercostal spaces
↓ (b) Pleura
↓ (c) Lungs
(C) **Cervical invasion:**
(a) Supra-clavicular glands
↓ (b) Dome of the pleura
↓ (c) Pleura and lungs

(3) **Brain:**
Methods:
(A) **Blood embolism**
(B) **Cervical lymphatic permeation:**
(a) Supra-clavicular glands
↓ (b) Inferior cervical glands

↓ (c) Superior cervical glands
↓ (d) Basal cranial glands
↓ (e) Intra-cranial permeation

(4) **Bones:**

Tissues: (a) Ribs
(b) Sternum
(c) Vertebræ
(d) Humerus
(e) Femur

Methods.

(A) **Lymphatic permeation:** Handley
(B) **Blood embolism:** Piney

(5) **Opposite axillary glands and breast:**

Methods:

(A) **Independent**
(B) **Retrograde lymphatic permeation:**
(a) Breast: primary
↓ (b) Midline. crossed
↓ (c) Opposite axillary glands
↓ (d) Opposite breast

Pathological effects of carcinoma on clinics:

(A) **Infiltration:**
(1) Fixity
(2) Induration
(3) Loss of discrete boundaries
(4) Adhesions
(5) Actual infiltration or fungation

(B) **Post-permeation fibrosis:**
(1) Retractions
(2) Deviations
(3) Displacements
(4) Dimpling or shrinking
(5) Adhesions

(C) **Lymphatic obstruction:**
(1) Peau d' orange
(2) Cancerous pachydermia
(3) Brawny arm
(4) Serous effusions

(D) **Failure of nutrition:**
(1) Ulceration
(2) Umbilication

(E) **Metastases:**
(1) Lymph glands: enlargement
(2) Skin around: nodules
ulcers

(3) Thorax } (a) Effusions
(4) Abdomen } (b) Growths
(c) Pressure effects
(5) Bones: erosions

Clinic: of breast carcinoma

(A) *Local signs.*

(1) **Breast:**

(A) **Lump:** Single, hard-fleshy-soft, palpable, non-discrete, irregular

(B) **Ulcer:** Malignant

: (a) Fixed and merging in breast tiss.

↓ (b) Fixed to the muscle

↓ (c) Fixed to the thoracic wall

(2) **Nipple:**

(a) Retraction
(b) Deviation
(c) Displacement
(d) Discharge

(3) **Skin:**

(a) Puckering
(b) Adhesions
(c) Lymphœdema.
  (α) Peau d' orange · pig skin
  (β) Pachydermia: leathery skin
(d) Cancer *en cuirasse:*
  . Nodular or diffuse infiltration
(e) Nodules
(f) Ulceration: malignant ulcer
(g) Fungation

(B) *Regional signs:*

(1) **Axillary glands:**
: Enlarged, hard, discrete→matted→fixed

(2) **Supra-clavicular glands:** Enlargement

(3) **Brawny arm:** Elephantiasis+paralysis

(C) *Distant signs:*

(1) **Bones:**

(a) Local pain and tenderness
(b) Pathological fracture
(c) Deformity

(2) **Abdomen:**

(a) Epigastric angle:
  (α) Pain and tenderness
  ↓ (β) Subcutaneous nodules

- (b) Liver: enlargement
  : knobby → umbilicated
- (c) Peritoneum: ascitis hæmorrhagica
- (d) Omentum: nodular feel
- (e) Pelvis:
  - (α) Krukenburg's tumours
  - (β) Pouch of Douglas metastases

(3) **Thorax:**
- (a) Mediastinal glands: enlargement
- (b) Pleura: blood-stained effusion
- (c) Lungs.
  - (α) Signs of bronchitis
  - (β) X-Ray

(4) **Opposite breast** and axillary glands

Local signs in different forms of carcinoma:

(1) **Colloid carcinoma:**
- (a) Elderly age: menopause
- (b) Slow growth
- (c) Enormous size
- (d) Soft feel: **pseudo-fluctuation**
- (e) More mobility
- (f) Signs of fibrosis absent
- (g) Low malignancy
- (h) Translucent areas: on biopsy

(2) **Atrophic scirrhus:**
- (a) Thin and very aged patients
- (b) Very chronic course
- (c) Fibrosis signs very marked:
  : **Atrophied breast**
- (d) Lump impalpable
- (e) Relation to axillary glands:

	growth	glands
(α)	+	+
(β)	+	—
(γ)	—	+

(3) **Scirrhus carcinoma:**
- (a) Between 35 and 60
- (b) Moderate rate of growth
- (c) Moderate size
- (d) **Hard feel**
- (e) Fibrosis signs marked
- (f) Moderate malignancy

(4) **Encephaloid carcinoma:**
- (a) Young and fat patients: 30—45
- (b) Rapid rate of growth
- (c) Large size
- (d) **Soft feel**

(e) Fibrosis signs not marked
(f) High malignancy
(g) Ulceration and fungation

(5) **Mastitis carcinomatosa :**
(a) Lactating patients in prime of youth
(b) Extremely rapid growth and course
(c) Involvement of whole breast
(d) Pseudo-inflammatory signs :
(1) Redness
(2) Induration
(3) Œdema · Peau d' orange
(4) Toxæmia
(e) **Negative aspiration in: a case of suspected acute mammary abscess**

(6) **Duct carcinoma :**
(A) **Large duct :**
(a) **Blood-stained nipple-discharge**
(b) Subareolar, small, irregular tumour
(c) Sector-shaped induration
(B) **Small duct :**
· Ordinary spheroidal celled carcinoma
(C) **Multicentric or mastitic carcinoma :**
Syn · Diffuse intraductal carcinoma
Path : Chronic duct catarrh
↓ Diffuse intraductal papillomatosis
↓ Diffuse intraductal carcinomatosis
Clinic . (a) Diffuse lumpiness
(b) Discharge from nipple

(7) **Intra-cystic papilliferous carcinoma :** Reclus
(a) **Biopsy :** Cauliflower or papillomatous growth within a cyst removed
(b) Fungation : papilliferous or cauliflower mass after rupture of a cyst

(8) **Paget's disease :** (See under Nipple)

(9) **Carcinoma of male breast :**
Etio : 1%
History of injury or chronic irritation
Clinic : **Button-like induration**
Early adhesions

(10) **Peripheral carcinoma :**
Syn : Carcinoma of axillary tail
Clinic : Localised lump near the axillary margin
Diff. diag : Enlarged axillary glands

(11) **Impalpable carcinoma :**
Path : Microscopical primary

Clinic: (*a*) No primary detected
(*b*) Axillary metastases +
Treat: Radical excision of the breast

Special signs of carcinoma breast:

(A) **Exploration:**
Tech: (1) Enucleation of the growth without incision into it
or (2) Excision of that part of the breast which contains the growth
or (3) Amputation of the whole breast containing the growth

↓ (B) **Macroscopic examination:** After bisection
(*a*) Hemogeneity of tissue of the growth
(*b*) Difference from normal tissue:
(α) By vision
(β) By feel
(*c*) Absence of capsule with **irregular infiltration** of tissues

↓ (C) **Microscopic examination:** After section

Clinical pictures of axillary glands in breast carcinoma:

(1) **Not enlarged:**
(*a*) Not affected
(*b*) Microscopically affected:
In every case of carcinoma breast, axillary glands must be taken to be affected and removed, though enlarged or not.

(2) **Enlarged:**
Path (*a*) Due to infection only: tender
(*b*) Due to malignant metastases

Clinic: (1) *Number:*
(*a*) Single gland
↓ (*b*) Group of glands
↓ (*c*) Regional glands
↓ (*d*) Extra-regional glands

(2) *Consistency:*
(*a*) Stony hard
or (*b*) Hard
or (*c*) Fleshy
or (*d*) Soft
or (*e*) Fluctuating

(3) *Mobility:*
(*a*) Freely mobile
↓ (*b*) Adherent
↓ (*c*) Matted
↓ (*d*) Immobile

Diff. diag. of Carcinoma Breast:

: From every other condition of the breast:

(1) Trauma:		
Fat necrosis	from	Scirrhus
(2) Acute inflammations.		
Acute mastitis	from	(a) Pseudo-inflammatory (b) Multicentric
(3) Chronic inflammations:		
Local mastitis	from	Scirrhus
Chronic abscess	from	(a) Encephaloid (b) Colloid
(4) Specific inflammations:		
Tuberculosis	from	Scirrhus
Gumma	from	Scirrhus
Elephantiasis	from	(a) Pseudo-inflammatory (b) Multicentric
(5) Hyperplasias:		
Megalomastia	*from*	*(a) Pseudo-inflammatory* (b) Multicentric
Chronic mastitis	*from*	*(a) Scirrhus* (b) Duct carcinoma
(6) Tumours:		
Fibro-adenoma	from	(a) Scirrhus (b) Encephaloid
Duct papilloma	from	Duct carcinoma
(7) Skin conditions:		
Eczema	from	Paget's disease

Treat: (1) **Prophylactic:**

(A) **Removal of any lump in the breast after 40**

(B) Prophylactic **X-Ray** radiation of chronic mastitis

(C) Education of the public: early diagnosis

(2) **Curative:**

(1) **Radical operation** for carcinoma breast

Removal of:

(1) Circular **skin and subcutaneous** tissues around the growth

(2) Whole of the **breast**

(3) Circle of **deep fascia:**

Clavicle
↑
: Beyond midline ← growth → lat. dorsi
↓
Rectus sheath

(4) **Muscles:** Both pectorals
Serratus anterior
Lat. dorsi
Subscapularis fascia
Rectus sheath
External oblique

(5) **Axillary contents**

(6) Supra-clavicular fossæ: at times

Preserving:

(1) Axillary vessels
(2) Cephalic vein: if possible
(3) Nerve of Bell
(4) Long subscapular nerve
(5) Cords of the brachial plexus

Contraindications:

(A) *Local:*

- (1) Skin affection.
  - More than 2" from the growth
    - (a) Cancer *en cuirasse*
    - (b) Skin infiltration
    - (c) Malignant nodules
- (2) **Fixation to bony thorax**
- (3) Carcinomatous mastitis
- (4) Atrophic scirrhus in old age

(B) *Regional.*

- (1) **Axillary glands fixed:**
  - to (a) Bony thorax
  - (b) Main vessels: artery
  - (c) Main nerves
- (2) Brawny arm
- (3) Supra-claviculars: hard and fixed
  - : With growth in the lower half
- (4) Nodules at the intercostal spaces

(C) *Distant:*

- (1) Opposite axillary glands or breast involved
- (2) **Abdominal metastases:**
  - (a) Liver + + ; or jaundice
  - (b) Palpable masses
  - (c) Ascitis
  - (d) Ovarian tumours
  - (e) Pouch of Douglas

(3) **Thoracic metastases:**
  (*a*) Intercostal nodules
  (*b*) Mediastinal pressure signs
  (*c*) Pleurisy with effusion
  (*d*) X-Ray lung

(4) **Bone metastases:**
  (*a*) Localised or referred pain
  (*b*) Local tenderness
  (*c*) Local deformity
  (*d*) Spontaneous fracture
  (*e*) Local bony erosion

(D) *General:*

(1) Age:
  (*a*) Very old:
    : with atrophic scirrhus
  (*b*) Very young:
    : with mastitis carcinomatosa

(2) General condition:
  (*a*) **Debility**
  (*b*) Plethora

(3) Constitutional diseases:
  (*a*) Diabetes
  (*b*) Heart disease
  (*c*) Liver cirrhosis
  (*d*) Tuberculosis

(4) Rapid course of the disease

Even if a carcinoma breast is seemingly inoperable, operation is better, provided:

(1) Local growth excisable
(2) No visceral deposits

Advantages:
(1) No local complications
(2) No axillary complications:
  (*a*) Brachial neuralgia
  (*b*) Arm lymphœdema
(3) Death from painless metastases:
  (*a*) Thoracic
  (*b*) Bone

(II) **Deep X-Rays:**

Ind: **Superficial but extensive areas**

As: (1) Pre-operative
  (2) Substitute for operation
  (3) Post operative adjunct
  (4) Superficial recurrences

Tech: (a) Pre-operative:
: Six weeks before operation
(b) Post-operative:
: After healing of the wound
: Two courses of three months each with an interval of three months

(III) **Radium:**

Ind: **Deep and small local foci**

As: (1) Substitute to operation
(2) Addition to operation
(3) Post-operative: prophylactic
(4) Local recurrences: curative

Contraind. Tumours more extensive than 3 inches

Tech: As an addition to operation

	Site	*Needles*
(1)	Around and in the growth (Interstitial or gridiron)	: 15
(2)	Axillary cone	: 5
(3)	Subpectoral	: 5
(4)	Supra-clavicular	: 3
(5)	Costo-coracoid membrane	: 2
(6)	Intercostal spaces 2, 3, 4, 5	: 1 each
	Total amount	: 95 mgm.
	Needles in position	: 8-10 days

Operative results:

(A) Cures (5 years): if : Axillary glands
80% . . . . Impalpable
40% . . . . Palpable

Prognosis: **Presence or absence of axillary metastasis**

(A) **Factors favouring growth:**
(1) Youth, pregnancy, lactation
(2) Location in inner or lower quadrant
(3) Low state of differentiation (small celled)
(4) Incomplete and rough surgery
(5) Low resistance

(B) **Factors retarding growth:**
(1) Senile involution
(2) Location in outer and upper quadrant
(3) Higher differentiation: adeno-carcinoma
(4) Colloid degeneration
(5) Radical surgery:
: With pre and post-irradiation
(6) Raised resistance

Factor		Good	Bad
(1) **Age**		Old	Young
(2) **Activity**		Nil	(a) Pregnancy (b) Lactation
(3) **Stage**	Local	Fibrosis	Encephaloid
	Regional	Axillary gls.—	Axillary gls. +
	General	Good health	Bad health
(4) **Course**		Slow	Rapid
(5) Build		Fat	Thin
(6) Site		Central	Peripheral
(7) Sex		Females	Males
(8) **Treatment**		Early	Late

Recurrences : (A) *Localised :*

(1) **Local :**

(A) In the scar

(B) Around the scar : secondary bosses

(2) **Axillary :** Brawny arm; brachial neuralgia

(3) **Parasternal :**

Clinic ·

(*a*) Painful nodules → ulcers :
: Intercostal spaces ; along the sternal edge

↓ (*b*) Superior mediastinal pressure signs

↓ (*c*) Pleural effusion

(4) **Supra-clavicular :**

Path · (A) Primary focus in super-int. quadrant

(B) Secondary :
to (*a*) Parasternal glands
(*b*) Axillary glands

Clinic : Enlarged glands at the lower and inner angle of the posterior triangle of the neck

(5) **Spinal :**

Clinic : 'Pott's disease' in elderly females :
Pain + tenderness + d e f o r m i t y + paraplegia

(6) **Bony :**

Clinic : (*a*) Localised pain or tenderness
(*b*) Pathological fracture
(*c*) Localised pseudo-periosteomyelitis
(*d*) X-Ray

(B) *Extensive*:
(1) **Thoracic**: Mediastinal, pleural
(2) **Abdominal**: Liver, peritoneum, pelvis

Treatment: of recurrences
(A) Localised recurrences:
(1) Prophylactic:
(*a*) Operative excision:
: During radical operation
+ (*b*) Radium implantation
↓ (*c*) Post-operative deep X-Ray
(2) Curative:
. Radium implantation
(B) Extensive recurrences:
(1) Prophylactic:
(*a*) Pre-operative deep X-Rays
(*b*) Extensive radical operation
(*c*) Post-operative deep X-Rays
(2) Curative:
: Deep X-Ray exposures

Procedures: With indications
(A) **Radium: Localised deep foci**
(B) **Deep X-Rays: Extensive superficial foci**
(C) Ovariectomy . bilateral or Irradiation of pelvis } : osseous metastases

Treatment: of brawny arm
(1) Postural
(2) Handley's lymphangioplasty: silk

Treatment: of brachial neuralgia
(1) Alcohol injection into the nerve plexus
(2) Amputation

Post-operative investigations . after radical operation
Examine every case every three months or as soon as something wrong is noted:
(1) History: losing weight; cough; pain
(2) **Examine**: (*a*) **General health**
(*b*) **Local area**
(*c*) **Regional area**:
: Axillary
Supra-clavicular
Parasternal
(*d*) **Metastatic area**:
. Thorax
Abdomen
Pelvis
Spine
Bones
(3) **Radiograph**: Chest
Bones

(4) SARCOMA OF THE BREAST.

Etio:

Age: 30–50

Causes: (*a*) Trauma

(*b*) Fibro-adenoma

Incidence: 1% of all malignant growths of the breast

Path: (*a*) Fascial fibro-sarcoma

(*b*) Fibro-adenomatous fibro-sarcoma

(*c*) Fibro-cystic sarcoma of Brodie

(*d*) Lympho-sarcoma

(*e*) Chondro-sarcoma

Clinic: Large, prominent, lobulated, soft, very rapid, vascular tumour

Diagnosis (1) No signs of fibrosis

(2) Vascularity

(3) Very rapid growth

(4) Internal metastases

Diff. diag. (1) *Soft fibro-adenoma*

(2) Encephaloid carcinoma

(3) Fungating cyst-adenoma

(4) Diffuse hypertrophy

Compl: (1) Fungation

(2) Secondary hæmorrhage

(3) Metastases

(4) Cachexia

Treat. (1) Early radical operation

(2) Irradiation by deep X-Rays.

Ind. Lympho-sarcoma

(5) OTHER RARE TUMOURS OF THE BREAST:

(A) Teratoma

(B) Squamous carcinoma

(C) Melanoma

(VII) CYSTS OF THE BREAST:

(1) CYSTS FROM LARGER DUCTS: Single

(A) Galactocele:

Clinic: (*a*) Lactation

(*b*) Milky discharge from nipple

(*c*) Single subareolar cyst

Treat: Excision

Post. compl: Milk fistula

(B) Simple subareolar cyst:

Clinic: (*a*) Serous or absent nipple discharge

(*b*) Single subareolar cyst

Treat: (*a*) Tapping + Injection of 10 min. of 1% Protargol

(*b*) Excision

(2) CYSTS FROM SMALLER DUCTS: Multiple
- (A) **Chronic interstitial mastitis**
- (B) **Chronic duct catarrh**

(3) CYSTS FROM LYMPHATIC SPACES

(4) CYSTS FROM SIMPLE TUMOURS:
- (A) **Cystic fibro-adenoma:**
  : Serocystic disease of Brodie
- (B) **Cystic duct papilloma**

(5) CYSTS FROM MALIGNANT TUMOURS:
: Rapid and large
- (A) **Carcinoma**
- (B) **Sarcoma**

(6) PARASITIC CYSTS: **Hydatid**

Special signs : of breast cysts

- (1) Translucency
- (2) Aspiration
- (3) Exploration
- (4) Biopsy

(VIII) MASTODYNIA:

Etio: Neurasthenia
Path · No organic lesion
Clinic · Pain and tenderness in premenstrual period
Diff. diag: From any organic lesion
Treat: Ovarian tablets 5 grs. once a day

(IX) OPERATIONS ON THE BREAST:

(1) MAMMARY ABSCESS: Incision and drainage

Tech: (A) Radial incision (See under Acute Mammary Abscess)
- (B) Sheild's method: („ „ „ „ „)
- (C) Bailey's method: („ „ „ „ „)
- (D) Retro-mammary drainage: (See under „ „)

After-treat: (See under Mammary Abscess)

Post. compl: (1) Milk fistula
- (2) Delayed healing:
  - (a) Lack of rest: support and sling
  - (b) Pocketing
  - (c) Specific
  - (d) Lack of resistance
- (3) Fibrosis: deformed or retracted nipple

(2) ENUCLEATION OF A SIMPLE TUMOUR: Fibro-adenoma
- (A) Direct method:
  - (1) Radial incision down to the capsule
  - ↓ (2) Incision of the capsule
  - ↓ (3) Enucleation of the tumour from inside the capsule

(B) Gaillard Thomas' method:
- (1) Incision Submammary sulcus
  Lower and outer quadrant
- (2) Strip up the breast from the pectorals
- (3) Radial incision in the deep aspect of the breast
- (4) Excision or enucleation from the deeper aspect of the breast
- (5) Buried sutures to approximate breast tissue
- (6) Drainage

Post. compl: (1) Milk fistula
(2) *Hæmatoma* → sepsis

(3) PARTIAL EXCISION OF THE BREAST:

Ind. (1) Non-malignant local condition
(2) Suspicious lump requiring biopsy

Tech: (A) Direct method:
- (1) *Radial local incision*
- (2) Wedge-shaped resection:
  : Of the lobes containing the lump
- (3) Buried sutures

(B) Gaillard Thomas' method:
Excision through the deeper aspect of the breast, stripped up through the submammary incision

(4) MASTECTOMY: Amputation of the breast

Ind: (1) Gynaecomastia
- (2) Simple hypertrophy: megalomastia
- (3) Chronic interstitial mastitis: after 50
- (4) Chronic duct catarrh
- (5) Tuberculosis
- (6) Actinomycosis
- (7) Elephantiasis
- *(8) Discharging chronic sinuses*
- (9) Large or fungating innocent tumours
- (10) Large or multiple cysts
- (11) Suspected malignancy:
  : For biopsy
- (12) Inoperable malignancy with local complications:
  - (*a*) Ulceration
  - (*b*) Fungation

Tech: (A) Without preservation of nipple:
- (1) Elliptical incision:
  : Includes affected skin
- (2) Elevation of skin flaps:
  - (*a*) Keep some fat
  - (*b*) Keep warm
- (3) Delimitation of the breast:
  : By exposure of pectoral fibres
- (4) Dissect out the breast
- (5) Hæmostasis:
  : (*a*) Long thoracic artery
  (*b*) Sternal arteries

(6) Drainage:
- (a) Axillary
- (b) Epigastric
- (c) Down and out quadrant

(B) With the preservation of nipple:
- (1) Gaillard Thomas incision
- (2) Excision through the deeper aspect

Post. compl: (A) Local: (1) Hæmatoma
- (2) Sepsis
- (3) Sloughing of the flaps
- (4) Non-healing
- (5) Scar abnormalities

(B) General: (1) Shock
- (2) Chest complications
- (3) Heart failure

(5) Mammaplasty: Plastic operations on the breast

Ind: (a) Sagging breast
- (b) Abnormal size
- (c) Abnormal shape

Object: Restoration of normal size and shape

Tech: (a) Preserve the nipple with areola
- (b) Preserve the blood supply

(6) RADICAL OPERATION FOR BREAST CARCINOMA OR SARCOMA:

(A) Pre-operative considerations:

(1) Operability of the growth:

Every carcinoma of the breast is operable unless contraindicated: (See under Carcinoma Breast)

Contraindications. (1) Local
- (2) Regional
- (3) Distant
- (4) General

(2) Pre-operative preparation:

(A) Heart and circulatory system:

Examine: (a) The heart
- (b) Blood pressure
- (c) Condition of arteries

Treat: (a) Course of digitalis
- (b) Course of Thyroid and Lugol's sol.

(B) Blood:

Examine: (a) Hæmoglobin
- (b) Coagulation time
- (c) Bleeding time

Treat: (a) Blood transfusions
- (b) Hæmatinics
- (c) Coagulants

(C) Respiratory system:

Examine: The pleuræ and lungs

Treat: (a) Prophylactic anti-catarrhal vaccine
(b) Camphor in oil

(D) Urinary system:
Examine. The kidneys and urine
Treat: (1) Hydrotherapy
(2) Diuretics
(3) Urinary antiseptics: if sepsis

(E) Digestive system:
Examine: The liver
Treat: Regulation of the bowels

(F) Metabolic or general diseases·
Examine for (a) Nephritis
(b) Diabetes
(c) Tuberculosis etc.

(G) Nervous system: sedatives; assurance

(H) General preparation:
(1) Blood transfusions
(2) Glucose. (a) By mouth
(b) Intravenous
(Subcutaneous insulin 10 units to be followed by intravenous glucose 25% 20 c.cs)
(3) Soda bi-carb
(4) Hydrotherapy (a) Mouth
(b) Rectum
(c) Intravenous: on table

(I) Prophylaxis of infections:
(1) Course of anti-catarrhal vaccine·
· For respiratory complications
(2) Course of mixed pyococcal vaccine:
: For wound infections

(J) Pre-operative irradiation·
Ind. (a) Carcinoma in young
(b) Carcinoma in pregnancy
(c) Encephaloid carcinoma
(d) Axillary glands + +
Time. 4-6 weeks before operation

(B) Anaesthesia:
General: Chloroform ether mixture
. Pure ether → (a) Respiratory catarrh
(b) Hæmorrhage
Pure chloroform → Acidosis

(C) Technique:
(1) Rodman· axilla → breast
Advantages: (a) Tedious part done first
(b) Better control over bleeding
(c) Contra-indications discovered early
(d) Early division and sealing of lymphatics
(e) Exposure of thorax wall late and minimum
(2) Handley: breast → axilla

Advantages: (*a*) No spilling of carcinomatous cells from divided lymphatics in the early part of the operation

Steps: (A) Axillary dissection:

(1) Incision: Parallel to and 2 finger-breadth inside the delto-pectoral sulcus
: Clavicle to pectoralis insertion

(2) Division of pectoralis major insertion

(3) Division of pectoralis minor insertion

(4) Division of costo-coracoid membrane

(5) Dissection of axillary cellular tissue:

(*a*) Apex to base

(*b*) Axillary vein -> inwards

(6) Ligature of the branches of axillary vessels

(7) Take care of -

(*a*) Long thoracic nerve: inner wall

(*b*) Thoraco-dorsal nerve · posterior wall

(*c*) Superior thoracic art.: apex

(*d*) Axillary vein: lateral wall

Points (α) Soft handling
(β) Immediate ligature of branches
(γ) Soft tissue cover
(δ) No drain in contact

Excise, if: (α) Adherent glands
(β) Operative injury

Sequelæ: (α) Brawny arm
(β) Embolism

(*e*) Cephalic vein: if possible

(B) Excision of the breast:

(*a*) Surgical excision:

(1) Incision:

(*a*) Ring incision: around the growth

(*b*) Axillary tail: across axillary base

(*c*) Ensiform tail: towards epigastrium

(2) Elevation of skin flaps:

(*a*) One foot diameter all around

(*b*) In the mid-plane of subcutaneous tissues

(*c*) Wrap up in hot saline towels

(*d*) No buttonholing

(*e*) Methods: (α) Dissection
(β) Transfixion

(3) Delimitation of deep fascia: 10 inches all round
Boundaries:

(*a*) Superior: clavicle

(*b*) Medial: inner margin of opposite pectoralis

(*c*) Lateral: inner margin of deltoid
posterior axillary fold
anterior part of latissimus dorsi

(*d*) Inferior: anterior rectus sheath on both sides

(4) Division of muscles:
  (a) Pectoralis major: whole
  (b) Pectoralis minor
  (c) Serratus anterior slips
  (d) External oblique slips
(5) Hæmostasis
  (a) Branches of axillary vessels
  (b) Perforating branches of int. mammary

(b) Diathermy excision.
  Advantages (1) Destruction of cancer cells
  (2) Warmth preserved
  (3) Less hæmorrhage
  (4) Less shock
  (5) Good healing
  Disadvantages (1) Ether contra-indicated
  (2) Lowered resistance to pyococci
  (3) Overheating → sloughing

(c) Additional steps:
  (1) Implantation of radium tubes or needles
    (See under Carcinoma Breast)
    (a) Supra-clavicular
    (b) Intercostal parasternal
    (c) Axillary
  (2) Excision of supra-clavicular glands.
    Ind. (a) Palpable enlargement
    or (b) Primary in the upper quadrant
    or (c) Highest axillary glands cancerous
  (3) Drainage:
    (a) Epigastric
    (b) Costal
    (c) Axillary
  (4) Approximation of the skin:
    (a) Avoid tension on sutures
    (b) If skin insufficient
      (α) Flap advancement methods
      (β) Thiersch's grafting

Difficulties in the operation:
  (1) Shock or collapse
  (2) Adiposity. (a) Good for local condition
    (b) Bad for general condition
  (3) Respiratory failure
  (4) Hæmorrhage:
    (a) Retraction of intercostal arteries
    (b) Trauma to axillary vein
    (c) Incomplete hæmostasis
    (d) Long coagulation time
  (5) Difficulty in closure of the wound:
  Treat: (a) Advance flaps
    (b) Skin grafting

(6) Implication of axillary vein:
: Excise (See above)
(7) Conditions requiring abandonment of operation:
(A) Implication of axillary artery
(B) Implication of brachial nerve cords
(C) Fixation to thoracic wall

After-treat. (1) Position: (a) Arm by the side: till wound heals
↓ (b) Arm abducted: after 10–15 days
(2) Anti-shock treatment
(3) Anti-pneumonia treatment
(4) Drainage: removed after 48 hours if no discharge
(5) Dressings: daily
: Removal of sutures which tend to cut out
Removal of accumulated serum or pus
(6) Movements of the shoulder } after healing of wound
(7) Mobilisation of the scar }
(8) Post-operative deep X-Rays: (See under Carcinoma Breast)
(9) Examination every three months:
: (See under Carcinoma Breast)

Post. compl. (A) General:
(1) Shock
(2) Syncope
(3) Heart failure
(4) Embolism
(5) Acidosis
(6) Chest complications
(7) Acute dilatation of the stomach
(8) Cachexia and debility
(9) Uræmia
(B) Local:
(1) Pain: due to flap tension
(2) Collection of blood or serum:
Clinic. (a) Local swelling
(b) Rise in temp.
Treat: Evacuate
(3) Flap complications:
(a) Sloughing
↓ (b) Ulceration
↓ (c) Retraction
(d) Cutting out of sutures:
Treat: Relieve the tension
↓ Skin grafting
(4) Wound complications:
(A) Infection:
(a) Suppuration
(b) Cellulitis
(c) Erysipelas
(d) Gangrene
(B) Non-healing

(5) Scar complications:
  (a) Weak: rest, skin graft
  (b) Adherent: massage, mobilisation
  (c) Painful: alcohol injection in intercostal nerves at the time of operation
  (d) Keloid: avoid friction
(6) Recurrences
(7) Arm complications:
  (a) Limited movements: early mobilisation
  (b) Brawny arm:

Brawny arm.

Causes: (1) Pre-operative·
. Malignant infiltration of all lymphatics and veins around the shoulder or/and of axillary vein
(2) Post-operative:
(A) Lymphatic obstruction:
Cause: Removal of axillary lymph glands and trunks
Clinic: Persistent brawny œdema with recurrent acute inflammtory attacks
(B) Venous obstruction
Cause· Thrombosis or scar pressure
Clinic Soft pitting œdema reacting to posture (elevation & abduction)
(C) Lymphatico-venous obstruction·
Clinic: Soft, pitting, reacting œdema
↓ Persistent brawny œdema

Clinic: Elephantiasis and partial paralysis of the superior extremity

Diff. diag: (1) Filariasis
(2) Elephantiasis neuromatosa
(3) Diffuse lymphangioma
(4) Acute cellulitis

Treat. (1) Postural. Elevation and abduction
(2) Sampson Handley's silk lymphangio-plasty
(3) Kondoleon's operation

(X) IMPORTANT POINTS

(A) The Nipple:

(1) Retraction of the nipple is:
  (a) A sign of carcinoma breast
  (b) An etiology of milk congestion → acute mastitis → acute mammary abscess.
(2) Any indolent affection of the nipple: ? chancre.
(3) Mother of a syphilitic child does not suffer from chancre.
(4) Skin disease round about nipple:
  ? (a) Eczema
  ? (a) Paget's disease

(5) Discharge from the nipple:
  (a) Serous: chronic interstitial mastitis
  (b) Bloody: duct papilloma or carcinoma
(6) Persistent serous discharge from nipple in a patient of cancer age: do mastectomy.
(7) Paget's disease: theories
  (a) Handley: post-cancerous lymph-œdema
  (b) Cheatle: duct carcinoma
  (c) Turnbull: basal-celled carcinoma
  (d) Muir: pre-cancerous duct-epithelial proliferation

(B) **Trauma of the breast:**
(1) Traumatic fat necrosis may be indistinguishable clinically from carcinoma breast.

(C) **Acute inflammations of the breast:**
(1) Acute mastitis is of two kinds:
  (a) Obstruction mastitis: cord-like ducts: ductitis
  (b) Abrasional mastitis: red streaks: lymphangitis
(2) Milk congestion → acute mastitis → mammary abscess.
(3) No incision in the breast should be made unless signs of abscess are definite
(4) Acute mammary abscess:
  (a) Radial incision
  ↓ (b) Counter incision
  \+ (c) Suction pump.
(5) Other treatments of acute mammary abscess:
  (a) Aspiration + lavage.
  (b) Small incision + closed drainage + lavage
(6) Breaking down all septa is a most important step in the operation for mammary abscess
(7) Non-amelioration of symptoms and signs after drainage of acute mammary abscess:
  ? Pocket
  ? Badly placed drainage tube,
  ? Some special kind of infection
(8) Omission of a sling to the upper extremity invites delayed healing of a breast wound.

(D) **T. B. breast:**
(1) Pain and tenderness are important distinguishing features of tuberculosis of the breast from carcinoma breast.
(2) A supposed cancer of the breast without axillary gland enlargement occuring under the age of 35, is likely to prove on biopsy to be tubercle.

(3) A painless lump in the breast, slow in growth, which goes on to abscess → rupture → sinus, at a younger age than carcinoma:
? T. B. breast.

(4) Any chronic induration in the breast, secondarily involving the skin and subcutaneous tissues:
? Tuberculoma
? Gumma
? Ulcerating fibro-adenoma
? Carcinoma

(E) **Chronic interstitial mastitis:**

(1) (*a*) Lymph-œdema
↓ (*b*) Fibrosis → cystic dilatations and granular feel
\+ (*c*) Epithelial hypertrophy → intra-cystic papilloma
↓ carcinoma.

(2) Chronic mastitis is a common involutional disease in menopausal period.

(3) Chronic interstitial mastitis may lead to malignancy:
(*a*) Periductal fibrosis → fibro-adenoma → sarcoma.
(*b*) Duct-epithelial proliferation → papilloma → carcinoma

(4) Chronic interstitial mastitis prepares the soil for malignancy just as cirrhosis of the liver or Paget's bone disease.

(5) Chronic mastitis and chronic cystic mastitis are stages of the same process which begins with permanent lymph stasis and not infrequently ends in carcinoma. (Sampson Handley)

(6) Every case of non-cystic chronic mastitis in a woman over 40, should receive a short prophylactic course of deep *X-Rays* as *a sedative to the epithelium* and should subsequently be seen every three months.

(7) A breast which has produced more than one cyst should be removed in a patient over 50.

(F) **Tumours of the breast:**

(1) Essential benign tumour of the breast is:
. Fibro adenoma

(2) Border line tumours of the breast are:
(*a*) Cystic adenoma
(*b*) Intra-cystic papilloma
(*c*) Chronic cystic mastitis

(3) Most common tumours of the breast: carcinoma
fibro adenoma.

(4) Very large tumours of the breast:
(*a*) Soft or cystic fibro adenoma

(*b*) Sarcoma
(*c*) Encephaloid or mucoid carcinoma.

(5) Large tumours of the breast with fluctuating areas :
(*a*) Cystic fibro-adenoma
(*b*) Cystic duct papilloma
(*c*) Cystic sarcoma.

(6) Groupes of breast tumours :
(*a*) Patients under 25 : non-malignant
(*b*) Patients over 25 : possibly malignant
The most helpful clinical evidence against malignancy is youth of the patient (below 25) except in cases of mastitis carcinomatosa.

(G) **Fibro-adenoma of the breast :**

(1) Fibro-adenomas arise from periductal tissues :
(*a*) Pericanalicular : hard
(*b*) Intra-canalicular . soft
(*c*) Cystic.

(2) Firm, encapsuled, slow, freely mobile tumour in a young breast with no signs of adhesions :
: Fibro-adenoma.

(3) During pregnancy rapid growth of fibro-adenoma may take place and may be mistaken for malignancy.

(H) **Carcinoma breast :**

(1) About 2 % of all women of cancer age will develop carcinoma breast.

(2) Cancer occurs less frequently in a breast that has been a seat of physiological function (lactation) frequently, but cancer once developed grows rapidly during the time of physiological activity.

(3) There are three views as to the etiological part of chronic interstitial mastitis in the causation of carcinoma breast
(*a*) Directly precancerous :
(α) Epithelial hypertrophy
↓ (β) Papilloma
↓ (γ) Carcinoma
(*b*) Indirectly precancerous :
· Prepares the soil as in cirrhosis liver
(*c*) Not precancerous.

(4) Most carcinomata arise in the ducts as irregular hyperplasia of columnar lining epithelium, the original states being :
(*a*) Chronic duct catarrh
(*b*) Duct papilloma

(3) A painless lump in the breast, *slow in growth*, which goes on to abscess → rupture → sinus, at a younger age than carcinoma :
? T. B. breast.

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(4) Most carcinomata arise in the ducts as irregular hyperplasia of columnar lining epithelium, the original states being:
(a) Chronic duct catarrh
(b) Duct papilloma

(5) Skin affections in cancer breast:
  (A) Infiltration: (*a*) Ulceration
  (*b*) Fungation
  (*c*) Cancer *en cuirasse*
  (B) Permeation: Nodules
  (C) Fibrosis: Adhesions and deformations
  (D) Lymph-œdema: (*a*) Peau d' orange
  (*b*) Pachydermia
  (*c*) Brawny arm

(6) Lymphatic phenomenon in breast carcinoma:
  (*a*) Peau d' orange
  (*b*) Brawny arm
  (*c*) Chylous pleurisy
  (*d*) Chylous ascitis

(7) Causes of signs and symptoms of breast cancer are:
  (*a*) Infiltration
  (*b*) Fibrosis
  (*c*) Lymph-œdema
  (*d*) Secondaries
  (*e*) Failure of nutrition

(8) Clinical varieties of carcinoma depend upon the continuous tug-of-war between:
  Fibrosis *vs.* Carcinoma cells
  : (*a*) Mastitis carcinomatosa
  ↓ (*b*) Encephaloid carcinoma
  ↓ (*c*) Scirrhus
  ↓ (*d*) Atrophic scirrhus
  ↓ (*e*) Impalpable carcinoma

(9) Special infiltrations at special sites:
  (*a*) Inner quadrant: parasternal
  (*b*) Outer quadrant: axillary
  (*c*) Upper quadrant: supra-clavicular
  (*d*) Lower quadrant: epigastric
  (*e*) Peripheral: thoracic wall

(10) The most important sign of a carcinoma breast is a lump with signs of fibrosis around

(11) Carcinoma breast examination:
  (1) Local: (*a*) Breast
  (*b*) Nipple
  (*c*) Skin
  (2) Regional: (*a*) Axillary glands
  (*b*) Supra-clavicular glands
  (*c*) Arm
  (3) Distant: (*a*) Thorax: effusion
  (*b*) Abdomen: (α) Epigastrium
  (β) Liver
  (γ) P.V. or P.R.

(c) Bones
(*d*) *Opposite* axilla and breast

(12) Remember the similarity between :
(*a*) Acute mastitis
(*b*) Mastitis carcinomatosa
(c) Filarial lymphangitis of the breast

(13) Chief conditions to be differentially diagnosed from carcinoma breast are:
(*a*) Fat necrosis
(*b*) Chronic local mastitis
(c) Chronic abscess
(*d*) Tuberculoma or gumma
(*e*) Mazoplasia with a cyst
(*f*) Fibro-adenoma
(*g*) Duct papilloma

(14) Principle of radical operation for carcinoma breast:
: Removal intact of the permeated lymph-vascular area surrounding the growth in one piece, with the lymph glands which may have been embolically invaded along trunk lymphatics.

(15) Determine whether a case is operable by exhaustive examination of the patient before undertaking an operation for radical removal of carcinoma breast:
Examinations : (1) Local
(2) Regional
(3) Distant
(4) General
(5) Special

(16) Most important contra-indications for radical excision of the breast are:
(*a*) Local. (α) Mastitis carcinomatosa
(β) Fixation to the bony thorax
(*b*) Regional: axillary glands fixed to:
(α) Bony thorax
(β) Axillary artery
(c) Distant: any distant metastases
(*d*) General: (α) Young age with rapid course
(β) Debility

(17) Do not fail to examine the following before operation for carcinoma breast.
(*a*) Axilla
(*b*) Supra-clavicular fossa
(c) Pleural cavity
(*d*) Epigastric angle and liver
(*e*) Pelvis
(*f*) Spine or ribs

(18) Radium: for deep and localised lesions
Deep X-Rays: for superficial and extensive lesions

(19) *A lump in the breast which is malignant should be removed before it is possible to tell clinically what it is.*

(20) Every doubtful tumour in the breast after the age of 30 *must be excised and subjected to biopsy; if found* carcinomatous, radical operation to follow immediately.

(21) Association of young age, pregnancy and lactation with breast cancer *may* by *accidental*, but *rapid* growth and early dissemination in such cases is the invariable rule.

(22) A great factor in prognosis is the axillary metastases, which is an index of parasternal metastases.

(23) Important points in bad prognosis are:
  (*a*) Youth
  (*b*) Physiological activity of the breast
  (*c*) Rapid course
  (*d*) Axillary metastases +
  (*e*) Time of treatment

(24) Adeno-carcinoma and colloid carcinoma have better prognosis.

(25) If the mammary cancer is confined to breast the patient has 75% chances of a five-year cure, if the axillary glands are invaded, only 25% chances.

(26) There is nothing more dramatic in surgery than the action of radium upon carcinomatous metastases.

(27) Deep X-Ray radiation has marked analgesic effect on bone deposits and especially on spinal deposits.

(28) Ovarian sterilisation (artificial menopause) is of definite palliative value to about one-third of the patients *with inoperable or recurrent carcinoma of the breast* or osseous metastases.

(29) Results of the combination of radical surgery with *irradiation are superior to those of radical surgery* alone.

(30) Examine every case every three months, after radical excision of breast carcinoma.

(I) Cysts of the breast:

(1) Subareolar fluctuating swellings:
  (*a*) Galactocele
  (*b*) Simple subareolar cyst
  (*c*) Cystic duct papilloma
  (*d*) Chronic mastitic cyst
  (*e*) Chronic T. B. abscess.

(2) A breast which has produced more than one cyst, *should be removed in a patient over fifty.*

(3) Cysts in connection with new growths:
 (*a*) Cystic fibro-adenoma
 (*b*) Cystic duct papilloma

(4) Cysts in connection with involutional mastitis: diagnose from chronic mastitis due to cysts

(5) Relation of cysts to chronic involutional mastitis is biphasic:
 ↑ Chronic involutional mastitis
 ↓ Cyst or cysts

(J) **Operations on breast:**

(1) Incision in a breast must always be radial.

(2) Other favourite incision is in the lower and outer quadrant in the submammary fold.

(3) It is worth while trying aspiration before open incision and drainage of an abscess.

(4) Exploration of suspicious tumour:
 : Excise it in toto without cutting into it; send it for biopsy.

(5) Gaillard Thomas method is good for treatment of deep lesions in the breast.

(6) Try to preserve nipple and areola wherever possible in removal of the breast for innocent lesions.

(7) Common causes of non-healing of breast wounds:
 (*a*) Lack of rest. sling and support
 (*b*) Tight sutures
 (*c*) General low resistance

(8) Do not forget the value of massage and mobilisation of breast scar and movements of shoulder joint, as soon as the wound has healed

(K) **Differential diagnosis:**

(1) A local lump in the midst of sector-shaped granular induration:
 (*a*) Cyst: galactocele or subareolar
 (*b*) Cystic chronic interstitial mastitis
 (*c*) Duct papilloma or carcinoma
 (*d*) Fibro-adenoma
 (*e*) Carcinoma

(2) Irregular nodular lump of the breast:
 (*a*) Chronic local mastitis
 (*b*) Fat necrosis
 (*c*) Carcinoma.

(3) Chronic mass in the breast:
 (*a*) Fat necrosis
 (*b*) Chronic abscess

- (c) Chronic local mastitis
- (d) Tuberculoma
- (e) Gumma
- (f) Cyst : (α) Mastitic
  - (β) With mastitis
- (g) Fibro-adenoma
- (h) Duct papilloma
- (i) Carcinoma

(4) Big swelling in the breast:
- (a) Soft or cystic fibro-adenoma
- (b) Sarcoma
- (c) Encephaloid or colloid carcinoma

(5) Swelling of the whole of the breast:
- (a) Physiological turgidity
- (b) Megalomastia
- (c) Acute mastitis
- (d) Mastitis carcinomatosa
- (e) Elephantiasis of the breast.

(6) Acute inflammatory or pseudo-inflammatory swellings:
- (a) Acute milk congestion
- (b) Acute mastitis
- (c) Mastitis carcinomatosa
- (d) Filarial lymphangitis
- (e) Sarcoma

(7) Ulcers of the breast:
- (a) Chancre
- (b) Paget's disease
- (c) Tuberculous
- (d) Gummatous
- (e) Ulcerating new growth.
  - (a) Carcinoma
  - (b) Cyst-adenoma
  - (c) Sarcoma

(8) Peau d' orange appearance in breast:
- (a) Carcinoma
- (b) Fat necrosis
- (c) Tuberculosis
- (d) Gumma
- (e) Chronic abscess
- (f) Filariasis

(L) Miscellaneous:

(1) Venous obstruction is the most common cause of post-operative œdema of the arm after radical excision of breast carcinoma.

(2) Brawny arm: causes
- (a) Pre operative: malignant infiltration of venules & lymphatics

(*b*) Post-operative: (*a*) Excision of lymphatics
(*b*) Obstruction to vein

Venous œdema: soft, pitting, reacting
Lymph-œdema : persistent, brawny

(3) If a tumour is detected in a woman of middle age, whatever its situation, examine the breasts for carcinoma.

(4) Any localised bone complaint in a woman of middle age, exclude metastases from carcinoma breast.

(5) Every female ought to be taught to make a periodical examination of her breast after middle age and to report immediately to a medical man, in case a lump is detected, even if it be painless and non-troublesome.

CHAPTER VII

THE ABDOMINAL WALL

(I) CONGENITAL ABNORMALITIES:

(1) EXOMPHALOS:

Def: Congenital defect of the closure of the anterior abdominal wall with non-retraction into the abdominal cavity, of a part of the intestines, covered by the amnion.

Varieties: (1) **Major:** Absence of a considerable portion of anterior abdominal wall

(2) **Minor:** Defect at the umbilicus only, protrusion of the gut being confined to within the umbilical cord

Clinic: (1) **Major:** Protruded mass of intra-abdominal contents, covered by a thin serous membrane merging at the margins of the defect, into normal muscular anterior abdominal wall

(2) **Minor:** Presence of a few coils of intestines into the fœtal part of the umbilical cord

Compl: (1) Incompatibility with life . in major cases
(2) **Trauma:** To the viscera at the time of ligature of the umbilical cord → fæcal fistula
(3) Sepsis
(4) Associated deformities

Treat: **Operative:**

(A) **Major:**

Tech: (1) Intra-abdominal accommodation of viscera
↓ (2) Excision and freshening of defect margins
(3) Sutural reformation of:
(a) Peritoneum
(b) Muscular wall

Compl: (1) Non-accommodation of viscera
(2) Shock
(3) Stoppage of respiration

(B) **Minor:**

Tech: (1) Reduction of intestinal coils
↓ (2) Closure of the umbilical gap

(2) EXTERNAL HERNIAS: (See under Hernia)

(a) Median: (1) Epigastric
(2) Total: devarication of the recti

(b) Umbilical

(c) Inguinal

(d) Femoral

(II) TRAUMA:

(1) SUBCUTANEOUS:

(A) HÆMATOMA:

(a) **Subcutaneous**

(b) **Intra-mural**

(c) **Retro-peritoneal:**

Etio: Run-overs

Path: Collection of blood in the loose extra-peritoneal tissues of the posterior abdominal wall

Sites. (a) **Perinephric:** In rupture kidney
(b) **Root of the mesentery**

Clinic (1) Fullness with rigidity
(2) Discoloration: late

Compl. (1) **Paralytic ileus:**
: In mesenteric cases
(2) Extravasation of urine:
: In kidney cases
(3) Sepsis: cellulitis, abscess

(B) RUPTURE OF THE MUSCLE:

Etio: (a) Outside trauma
(b) Strain

Compl. Traumatic interstitial hernia

(2) OPEN:

(A) PENETRATING INJURIES:

Etio: (a) Stab wounds
(b) Bull gore

Path: Depth and complications out of all proportions to the length and breadth

Clinic. (1) Incised, contused or lacerated wound
\+ (2) With or without prolapse and injuries of internal viscera

Compl: (1) **Internal injuries:**
With: (a) Prolapse
(b) Perforations
(c) Hæmorrhage
(2) **Sepsis:** (a) Superficial
(b) Peritoneal
(3) Sequela: scar hernia

Treat: **Always explore:** Never probe
↓ Debridement with or without drain

(3) BURST ABDOMEN:

Etio: (1) **Faulty sutures:**
(a) Too thin sutures
(b) Rapidly absorbable sutures
(c) **Continuous suture** in the muscles and faciæ of the abdominal wall

(2) **Post-operative strain:**
(a) Respiratory complications
(b) Constipation or dysuria
(c) Incomplete convalescence

(3) **Sepsis of the operation wound**

(4) **Digestion of the operation wound:**
. Access to pancreatic ferments

Clinic: (1) **Sudden:** Sudden burst open with immediate prolapse of the abdominal viscera

(2) **Gradual:**
(a) **Interno-external:**
: Burst-open of deeper layers
: Skin being the last to give way
(b) **Externo-internal:**
. Giving way of superficial structures
: Peritoneum being the last to give way

Compl: Sepsis -> peritonitis

Treat: (1) **First aid:** Protection of prolapsed viscera by hot sterile saline packs

(2) Deliberate.
(a) Thorough cleansing of the prolapsed viscera
↓ (b) Reposition of the viscera
↓ (c) Resuture of the abdominal wall

(III) INFECTIONS OF THE ABDOMINAL WALL:

(1) CELLULITIS:

Etio: (A) **External infection:** Traumatic, operative
(B) **Extra-peritoneal infection:**
: Extravasation of urine
(C) Peritoneal infection: secondary to
(α) Peritonitis
(β) Fistulæ

Path: (1) Streptococcal: from outside
(2) Gas gangrene: from intestines

Clinic: (a) Acutely spreading diffuse inflammatory swelling of the addominal wall
(b) Toxæmia

Compl: (1) Sloughing and spreading gangrene
(2) Septicæmia

Treat: (1) Sulphonamide group
(2) Antisera
(3) Multiple incisions with hypertonic pack

(2) ABSCESS:

(A) SUPERFICIAL: Subcutaneous abscess

(I) **Primary:**

Etio: (*a*) Trauma
(*b*) Operation · **stitch abscess**

Path: Pyococcal infection round about a wound or a suture

Clinic: (A) Local:
(*a*) Tender point
↓ (*b*) Induration
↓ (*c*) Fluctuation
(B) General. septic toxæmia

Compl: Sinus formation

Treat. Removal of the suture
Adequate drainage

(II) **Secondary:** To deeper infection
(*a*) Peritoneal: **hepatic abscess**
(*b*) Extra-peritoneal: perinephric abscess
(*c*) Muscular

(III) **Specific:**
(*a*) **Guinea-worm abscess**
(*b*) Bursting gumma
(*c*) Suppurating cold abscess

(B) INTRA-MUSCULAR ABSCESS:

Etio. (*a*) **Primary:**
(1) Traumatic: contusion
hæmatoma
(2) Pathological:
: pyæmic; suppurating gumma
(*b*) **Secondary:**
(1) Intra-peritoneal suppuration:
· Hepatic abscess
(2) Bone suppuration:
: Ribs or vertebræ

Clinic: (A) **Acute:** Acute regional inflammation with **rigidity of the whole of the particular muscle affected**
(B) **Chronic:** Localised non-inflammatory swelling

Diff. diag: (1) **From acute:** Intra-peritoneal suppurations
(2) **From chronic:** Other localised swellings:
(*a*) Intermuscular lipoma
(*b*) Gumma

(C) EXTRA-PERITONEAL ABSCESS:

Def: Localised pus in extra-peritoneal spaces

Etio: (*a*) **Local** sepsis:

- (α) External: penetrating wound
- (β) Internal: neighbouring viscera: kidney
- (γ) Local: suppurating hæmatoma

(*b*) **Pyæmic** abscesses

Site: (1) **Perinephric**
(2) Peri-ureteral
(3) Peri-vesical

Clinic, Treat. } (See under respective heads)

(3) GANGRENE OF THE ABDOMINAL WALL:

Etio: Predisposers: (1) Debility
(2) Metabolic diseases

Exciting: (1) Specific: **Gas gangrene**
(2) Non-specific.
(*a*) **Septic**
(*b*) **Idiopathic**

Path: Continously and rapidly spreading diffuse gangrene of the abdominal wall

Clinic: (1) Extensive sloughing with or without foul smell
(2) Bad general condition

Treat: (1) Treat the etiology
(2) Support the vitality
(3) Antisera
(4) Minimum surgical interference:
(*a*) Excision
(*b*) Cauterisation: whole or marginal
(*c*) Removal of sloughs
↓ (5) Hypertonic baths or packs

(4) SPECIFIC INFECTIONS ABDOMINAL WALL

(A) **Syphilis: muscular gumma**

Clinic: (*a*) Non-inflammatory induration
↓ (*b*) Inflammatory induration
↓ (*c*) Liquefaction
↓ (*d*) Ulceration

(B) **Tuberculosis:**

(1) Secondary **cold abscesses**
(2) T. B. intestines → adhesions → **fistulæ**

(C) **Actinomycosis:**

Sites. (1) Right iliac fossa
(2) Right hypochondrium

Path: Secondary to: (*a*) Cæcum
(*b*) Liver

(D) **Guinea-worm:**
(*a*) Subcutaneous abscess
(*b*) Subcutaneous calcification

(IV) NEOPLASMS OF THE ABDOMINAL WALL:

(1) LIPOMA:
(*a*) Subcutaneous: single or multiple
(*b*) Intermuscular: diff. diag. from cold abscess
(*c*) Extra-peritoneal: etiology of ventral hernia

(2) FIBROMA:

(A) **Desmoid tumour:**
Etio. (*a*) Linea atropica of females
(*b*) Scars
Path: Musculo-aponeurotic fibroma
Clinic: Slow-growing, localised, hard → soft tumour
Compl. (1) **Recurrence:** After removal
: Recurrent fibroid of Paget
(2) **Malignant degeneration:** Sarcoma
Clinic: Rapid growth
Infiltration
Treat: Complete excision

(B) **Neuro-fibroma:**
Sites: (*a*) Subcutaneous
(*b*) Retroperitoneal
Clinic: Multiple, variable in size
Scattered along smaller nerves

(3) SARCOMA:
(A) **Muscular:** (*a*) Primary
(*b*) Secondary to desmoid tumour
(B) **Retroperitoneal:**
Clinic: Rapidly enlarging huge swelling fixed to the posterior abdominal wall with rapid cachexia and secondaries

(4) CARCINOMA:
(A) Primary:
: Kangri cancer of Kashmir
: Carcinoma in the chronic-burn scar of the epigastrium, due to constant irritation of hot earthen bowl, kept in for warmth
(B) Secondary:
: Infiltration from visceral carcinoma

(V) HERNIAS: CONGENITAL AND ACQUIRED:

(See under Hernia)

(VI) FISTULAE OF THE ABDOMINAL WALL:

Varieties: (1) **Gastric: Acid reaction**
Skin irritation
(2) **Biliary: Alkaline reaction**
Skin irritation
Yellowish colour
(3) **Duodenal:** Alkaline reaction
Skin irritation and **digestion**
(4) **Fæcal:**
(A) High: fluid and irritating
(B) Low. solid and non-irritating
(5) **Urinary: Urinous smell**
(6) **Umbilical:** (See under Umbilicus)

Causes: (1) **Infection:** Tuberculosis
Actinomycosis
Diverticulitis
Regional enteritis
(2) **New growths:** Carcinoma
Sarcoma
(3) **Distal obstructions:** Urinary, fæcal
(4) **Operative:** Stomies
(5) **Congenital:** Patent omphalo mesenteric duct
(6) **Trauma**

Clinic. (1) Position of the fistula-opening
(2) Discharge. characters
(*a*) Physical. colour, smell, consistency
(*b*) Chemical. reaction, constituents
(*c*) Microscopical
(3) Effect on the surroundings.
: Irritation, digestion

Compl: (1) Irritation dermatitis
(2) Digestion of the skin

Treat: (1) **Conservative:**
(A) **Dressings:**
(*a*) Emollient: Vaseline, liquid paraffin
+(*b*) Anti-chemical.
(α) *Alkaline in acid fistulæ*
(β) Acid in alkaline fistulæ
(B) **Lessen the discharge:** Diet and drugs
(2) **Etiological:**
(*a*) Removal of distal obstruction
(*b*) Short circuit
(3) **Local:**
(*a*) Excision
↓ (*b*) Plastic closure

(VII) AFFECTIONS OF THE UMBILICUS:

(1) CONGENITAL AFFECTIONS:

(A) **Exomphalos** minor
(B) Congenital **hernia**
(C) Congenital sinuses or fistulæ: **omphalo-mesenteric**

(2) INFLAMMATIONS:

(A) **Infected umbilical cord:**

Compl. (1) Cellulitis
(2) Secondary hæmorrhage
(3) Tetanus
(4) Peritonitis

(B) **T.B. Peritonitis:**
Flat and chronically inflamed umbilicus

(C) **Umbilical dermatitis:**
: Deep and unclean umbilicus

(D) **Chancre** of the umbilicus

(E) **Cholesteatoma:** Umbilical calculus

(3) FISTULÆ OF THE UMBILICUS:

(A) **Fæcal:**
(*a*) Patent omphalo-mesenteric duct
(*b*) T.B. intestines or regional enteritis
(*c*) Carcinomatous infiltration

(B) **Urinary:** Patent urachus

Etio. Old age + urinary obstruction
Treat: Removal of urinary obstruction

(C) **Biliary**

(D) **Gastric**

(4) NEOPLASMS OF THE UMBILICUS:

(A) **Adenoma:**

Etio Patent omphalo-mesenteric duct
Path: Arises in the omphalo-mesenteric remnant associated with Meckel's diverticular columnar epithelium
Clinic: Raspberry-like tumour with mucoid discharge
Treat: Excision of the adenoma together with the omphalo-mesenteric duct

(B) **Carcinoma:**
(*a*) Primary
(*b*) Secondary: from
(α) Breast
(β) Stomach
(γ) Liver
(δ) Intestines

(C) **Melanoma**

(5) UMBILICAL HERNIA: (See under Hernia)

Varieties: (A) Pathological:
- (1) **Non-union** of umbilicus:
  : Congenital hernia
- (2) **Stretching** of umbilicus:
  : Infantile hernia
- (3) **Para-umbilical:**
  : Adult hernia

(B) Clinical:
- (1) **Juvenile:**
  - (a) Congenital: from birth
  - (b) Infantile: some months after birth
- (2) **Senile:**
  : Adult para-umbilical

Compl: (A) Juvenile: nil
(B) Senile: Irreducibility
Incarceration
Strangulation

Treat: (A) Juvenile: belt (upto 18 months only)
(B) Senile: (1) Mayo
(2) Gallie

(6) CAPUT MEDUSÆ.

Etio. Hepatic cirrhosis

Path: Venous obstruction

Clinic Prominent peri-umbilical veins

(VIII) IMPORTANT POINTS

(1) Beware of careless handling of the umbilical cord:
- (a) Rigid asepsis
- (b) Tight ligature
- (c) Tie away from the umbilicus.

(2) Expect paralytic ileus in retroperitoneal hæmatoma.

(3) Always explore a penetrating injury of the abdominal wall; it is worse than useless to probe it.

(4) Injuries of the abdominal wall can be divided into:
- (a) Uncomplicated
- (b) Complicated: with visceral injuries.

(5) Penetrating injuries of the abdominal wall:
- (a) Extra-peritoneal
- (b) Trans-peritoneal:
  - (α) Without visceral affection
  - (β) With visceral affection:
    - (1) Prolapse
    - (2) Perforation
    - (3) Trauma with hæmorrhage.

(6) Never put continuous sutures in the extra-peritoneal abdominal wall if you want to avoid burst-abdomen.

(7) Expect burst-abdomen in:
- (a) Operations on upper abdominal viscera: : Contact with digestive ferments
- (b) Post-operative straining: cough
- (c) Sepsis
- (d) Continuous sutures.

(8) Complications of operative wounds of the abdominal wall:
- (a) Serum collection
- (b) Hæmatoma
- (c) Stitch abscess
- (d) Subcutaneous abscess
- (e) Deep abscess
- (f) Cellulitis
- (g) Spreading gangrene.
- (h) Burst-abdomen

(9) Sequelæ of operative wounds of the abdominal wall:
- (1) Keloid
- (2) Scar hernia
- (3) Internal adhesions
- (4) Sinuses or fistulæ

(10) Most common cause of abdominal wall cellulitis is extravasation of urine. The cellulitis can be in two planes:
- (a) Subcutaneous: Rupture of external urethra
- (b) Submuscular / Extra-peritoneal }: Rupture of: internal urethra, anterior wall of bladder, ureters, kidneys.

(11) Post-operative non-healing sinus of the abdominal wall:
- (a) ? Retained septic suture
- (b) ? Specific infection
- (c) ? Non-healing cavity
- (d) ? Adhesion to bone.

(12) Abscess in the abdominal wall. think of
- (1) Pointing deep abscess:
  - (a) Hepatic
  - (b) Appendicular
  - (c) Subdiaphragmatic
  - (d) Peri-nephric
- (2) Suppurating gumma
- (3) Cold abscess
- (4) Guinea-worm abscess.

(13) Peritoneal abscess: rigidity is regional
Muscular abscses: rigidity is muscular
In the first case, rigidity is confined to the overlying region, irrespective of the muscles involved; in the latter case rigidity is confined to the particular muscle involved from its origin to its insertion, whatever the position of the abscess

(14) Most common *non-inflammatory localised swellings to be* differentially diagnosed from one another in the abdominal wall are:
   (*a*) Cold abscess
   (*b*) Lipoma or soft fibroma
   (*c*) Liquefying gumma
   (*d*) Guinea-worm abscess.

(15) Any indurated swelling in a muscle with or without inflammation: ? Gumma
   Try pot. iodide in heavy doses.

(16) Fibroma which recurs: recurrent desmoid tumour of Paget.

(17) Multiple small localised tumours in the abdominal wall:
   ? Neurofibromatosis
   ? *Multiple lipomata.*

(18) Localised induration in the abdominal wall:
   (*a*) ? Tuberculosis: adhesion → fistula
   (*b*) ? Gumma
   (*c*) ? Malignant infiltration
   (*d*) ? Deep abscess: coming to a head.

(19) Take care of the surrounding skin in a fistula of the abdominal wall, higher the fistula, more is the irritation.

(20) Emollient and anti-chemical dressings + regulation of the discharge by modification in the intake and by medical treatment: is the conservative treatment of fistulæ of the abdominal wall

(21) Flat umbilicus.
   . *Think of T. B peritonitis*
   Deep umbilicus:
   : Think of Meckel's diverticulum.

CHAPTER VIII

THE UPPER EXTREMITY

(A) THE HAND

(I) CONGENITAL AFFECTIONS:

(1) POLYDACTYLISM:

Def: An extra digit or portion of a digit

Path: (*a*) An additional digit joined to normal digit by:
- (1) Fibrous tissue
- (2) Articulation: with
  - (α) Metacarpal
  - (β) Carpal

(*b*) Bifid terminal phalanx

Treat: (1) Amputation
- (2) Excision of the phalanx: which is
  - (*a*) Smaller
  - (*b*) Divergent
  - (*c*) With a bad nail

(2) SYNDACTYLISM:

Def: Webbed finger

Treat: Operative:
- Time: At the age of three years
- Pre-oper. X-Ray plate
- Tech.

(A) First stage of web separation:
- (1) Basal **ear-ring** perforation
  - ↓ Lateral sutures
- (2) **Agnew:**
  - : Large, single, dorsal flap
- (3) **Norton:**
  - : Small, triangular dorso-ventral flaps

↓ (B) Second stage: (4) **Didot:** Palmar and dorsal longitudinal flaps

(3) MACRODACTYLY: Enormous overgrowth of a finger

(4) CONGENITAL CONTRACTURE: **Little finger**

Path: Contracture of the central slip of palmer fascia

Clinic: (*a*) **Metacarpo-phalangeal hyper-extension**
- (*b*) Flexion at both the inter-phalangeal joints

Diff. diag: (1) Dupuytren's contracture
(2) Contracture of the tendon
(3) Mal-ankylosis of joints
(4) Contracted skin scars

Treat: Excision of the central fascial slip

(II) TRAUMA:

Etio: (1) **Crush injuries:** Machines
(2) **Incised wounds:** Glass, stabs
(3) **Lacerated wounds:** Machines
(A) Skinned or degloved hand
(B) Severance of fingers or portions of hand
(4) **Punctured wounds:** Pricks, bites

Path. Injuries to:
(1) Nail bed avulsion
(2) Tendons: rupture, avulsion, division
(3) Bones: fracture
(4) Joints: laceration, dislocation
(5) Vessels palmar hæmorrhage
(6) Nerves division, rupture
(7) Fingers. separation
(8) Skin: laceration, degloving
(9) Foreign bodies: needles, thorns, glass, etc.

Compl. (1) **Hæmorrhage**
(2) **Infection → suppuration → sloughing**
(3) Gangrene
(4) Retention of foreign bodies
(5) **Adhesions and contractures**
(6) Tetanus, gas gangrene

Treatment.
(1) General anæsthesia
(2) Tourniquet
(3) Thorough exposure
(4) **Debridement:**
: Excise only dead or grossly contaminated tissues (leave the nerves & important vessels)
(5) **Control of hæmorrhage:**
Sources: (a) Superficial palmar arch
(b) Deep palmar arch
(c) Ant. and post. carpal arches
(d) Comes nervi mediani
(e) Digital arteries

Treat. (A) Temporary.
(a) Direct pressure
(b) Tourniquet
(B) Conservative:
: Local graduated pressure

(C) Operative:
- (*a*) **Ligature both ends**
- ↓ (*b*) **Ligature of brachial art.:**
  - Ind: (α) Failure of local treat.
  - (β) Sepsis with secondary hæmorrhage

(6) **Treatment of special conditions:**

(A) **Punctured wounds:**
- (1) **Immediate squeezing of drops of blood** (least three)
- (2) Cleansing or carbolisation
- (3) Sterile dressings
- (4) **Immobilisation** of the arm in a sling—till bed time
- (5) Seek surgical advice.
  - if: Pain, throbbing, swelling or tenderness next morning
- (6) **Immediate antiserum and sulphonamide therapy:** If prick is septic

Bite wounds:
- (1) Electric cauterisation
- (2) Excision in toto
- (3) Tetanus anti-toxin: if horse or cat bite
  Anti-rabic treatment: if dog bite
  Arsenic: if rat bite

(B) **Lacerated wounds:**
- (1) Debridement: remove only the dead or grossly infected tissue
- (2) Repair
- (3) Pedicle grafting: after sepsis is nil
- (*a*) **Skinned or degloved hand:**
  - (1) If skin is attached:
    - (α) Excision of only actually dead tissues
    - ↓ (β) Flavine or mercuro-chrome
    - ↓ (γ) **Replacement** of skin
    - ↓ (δ) Rubber tissue drainage
  - (2) If skin is lost:
    - (α) Thorough cleansing
    - (β) **Implantation** of the hand into a subcutaneous tunnel in the thigh

(*b*) **Complete or incomplete severance of a digit:**

(1) **Replacement** and suture

(2) Excision:

Ind: (*a*) Already dead

(*b*) 48 hours after replacement:

If. (α) Piece is lifeless

(β) Infection at suture

(*c*) **Button-hole extensor expansion:**

Etio: Direct trauma
Muscular violence

Path: Rupture of central band of extensor
+ Protrusion of the head of the first phalanx

Clinic: (*a*) Swollen proximal interphalangeal joint
(*b*) Flexion of first phalangeal joint
+ Extension of second phalangeal joint

Treat Immediate exposure and repair

After-treat. Fixation.
By: plaster cast
In· full extension
For four weeks

(C) **Incised wounds:** Cut wrist

(1) Application of rubber tubing tightly from below elbow downwards upto the lower third of the forearm

(2) **Explore**

(3) **Identify the divided structures**

(*a*) Arteries· ligature

↓ (*b*) Nerves· suture

↓ (*c*) Tendons· (α) Suture
or (β) Tendon transplant.

(3*a*) Methods of identification of tendons:

(*a*) Active movements by the patient

or (*b*) Following the muscle bellies (through a higher incision)

(4) **Suture the tendons and nerves**

(D) **Foreign bodies:** Needles

(1) X-Ray in two planes

or (2) **Screen** in two planes and mark the position by gentian violet

(3) Local or general **full anæsthesia**

(4) **Incise:**
- (a) **At right angles to the needle**
- (b) Parallel to tendons and nerves
- (c) As near the needle as possible
- (d) Feel by forceps or finger tip
- (e) Avoid injury to structures

(7) **Primary amputation:** For trauma to the hand
: Exceptional indications.
- (a) Mangling and pulping out of shape
- (b) Extensive laceration + pulped bones

Post-operative treat

Fixation of the wrist:
By. Plaster-of-Paris
In. Position of relaxation of sutured tissues
For: 10–15 days

(III) INFECTIONS OF THE HAND:

(I) ACUTE INFECTIONS OF THE HAND:

(A) NAIL INFECTIONS.

(1) **Onychia:**

Def: Acute inflammation and suppuration of **nail bed**

Etio. Crush fingers
Pricks under nails

Clinic: (a) Acute pain and tenderness
↓ (b) Yellow discoloration under the nail

Compl. (1) Death of the nail
(2) **Ascending lymphangitis**
(3) Chronic onychia and paronychia

Treat: (1) Heat and Bier
↓ (2) **Removal of the nail**
↓ (3) Hypertonic → emollient applications

(2) **Paronychia:**

Def: Inflammation and suppuration of **nail base**

Etio: **Infected hang-nail**

Clinic: (1) Acute inflammation around the nail base
↓ (2) Suppuration: (a) Around the nail
(b) Under the proximal nail

Compl: (1) Death of the nail
(2) **Ascending lymphangitis**

Treat: (1) Prophylactic: excision and iodisation of an hang-nail
(2) Conservative: heat and Bier

(3) Operative:
 (a) Lateral incisions with **turning back of basal flap**
 +(b) *Excision of the proximal half of the nail:* If required
(4) Post-operative:
 (a) Hypertonic pack or baths: 48 hours
 ↓ (b) **Sterile paraffin pack**
 + (c) **Sling**

(B) SUBCUTANEOUS INFECTIONS:

(1) **Boils:** On the dorsum
(2) **Carbuncles:** Rare
(3) **Infected wart or corn**
(4) **Subcuticular whitlow:**

Etio: Infection and suppuration of friction vesicles
Clinic: Pus under the cuticle
Compl: Ascending lymphangitis
Treat. Snip off the cutis
 ↓ Dry dressings with spirit

(5) **Subcutaneous whitlow:**

Etio: Infected wart or corn
 Boils
Path: Abscess in the subcutaneous tissues
Clinic: Swollen inflamed finger with no fluctuation
Treat: Lateral incisions
 Rubber dam drainage
 Hypertonic dressings

(6) **Superficial cellulitis:**

Etio: Superficial septic abrasion
Path: [illegible]
 ↓ [illegible] is
Clinic: [illegible]
 General toxæmia
Compl: (1) Ascending lymphangitis or cellulitis
 (2) Septicæmia
Treat: Conservative: (1) *Heat and Bier*
 (2) Sulphonamide and antisera

(C) FASCIAL SPACE INFECTIONS:

(1) ***Terminal pulp infection:***

Def: Infective inflammation→suppuration in the cellular tissues of the pulp of the ungual phalanx, from the tip to the level of the epiphyseal line of terminal phalanx base
Etio: Needle or *thorn* **pricks**, cuts, crushes, foreign bodies
Path: Infection → inflammation → suppuration:
 (a) Central: (α) Superficial
 (β) Deep

(b) Lateral
(c) Terminal : near the tip
(d) Total : whole space

Clinic : (a) Throbbing pain, } of the finger pulp
(b) Tenderness
(c) Swelling
(d) **Movements of the finger not affected**

Compl : (1) **Lymphangitis** → general complications
(2) **Osteomyelitis** → necrosis of the phalanx
(3) **Tenosynovitis**
(4) Onychia → death of the nail
(5) Deformed tender finger end

Treat : (1) Heat and Bier with rest in sling
↓ (2) **Pulp-split** or lateral incision :
: **Only upto ·5" distal to terminal crease**
↓ (3) Glove drain
↓ (4) Hypertonic packs or baths with Bier
↓ (5) Sequestrotomy or curettage :
· If necrosis of the phalanx

(2) **Thenar space infection :**

Def : Infective inflammation of the fascial space at the root of the thumb

Etio : (a) Punctured wound
(b) Ruptured **tenosynovitis :** Index and thumb

Clinic : (1) Inflammatory, painful, tender swelling of the thenar eminence
(2) **Thumb movements relatively unaffected**

Treat : (1) Heat and Bier
↓ (2) Incision and evacuation :
(a) **Incise : radial side dorsum of the second metacarpal**
(b) Hilton's method
(c) Drainage of : (α) Fascial compartment
(β) Affected tendon sheath
(d) Save radial art.

(3) **Middle Palmar space infection :**
: With lumbrical canals

Def : Suppuration in the mid-palmar fascial space and the lumbrical canals

Etio : (a) Penetrating wounds or pricks
(b) **Tenosynovitis :** Medial three
(c) Osteomyelitis of the metacarpals

Clinic : (1) **Obliteration of the palmar hollow**
↓ (2) Swelling of the finger webs
(3) **Extensive swelling of the dorsum**

Treat. (1) Heat and Bier with rest
↓ (2) Incision and evacuation:
(A) (*a*) **Incise: between metacarpals**
: split the finger webs.
↓ (*b*) Hilton's method
↓ (*c*) Drainage of:
(α) Fascial compartment
(β) Affected tendon sheath
(B) **Henry's drainage:**
(*a*) Incision: cuneiform → ulnar border of fifth metacarpal
(*b*) Retraction forwards of abductor quinti
(*c*) Division of opponens quinti
(*d*) Drainage

Point: **Take care of ulnar nerve and artery**

Adv. (1) Good drainage
(2) Scar not in pressure area

(4) **Pronator space infection:**

Def: Suppuration between
(*a*) Pronator quadratus with bones
and (*b*) Flexor tendons

Etio: Extension from the palmar infection

Clinic. (1) Inflammatory swelling on the volar aspect
(2) Wrist-joint fixed in flexion
(3) **Hourglass swelling**

Treat Incision and evacuation.
(*a*) **Incise: 2" along the inner side of the ulna starting 1·5" above the ulnar tip**
(*b*) Hilton between ulna and flexor tendons
(*c*) Counter-incision. on lateral side
(*d*) Drainage (α) Medial and lateral
(β) Affected tendon sheaths

(D) TENDON SHEATH INFECTIONS.

Syn: (1) Thecal whitlow
(2) Suppurative tenosynovitis

Def Infective inflammation → suppuration → sloughing of the flexor tendon sheaths

Etio: (1) Trauma:
(*a*) **Punctured wound: 50%**
(*b*) Lacerated wound: of flexor crease
(2) **Pulp infection and faulty incision for it:**
: Too proximal incision
(3) Osteomyelitis terminal phalanx

Site: First three fingers of the right hand

Clinic. (1) **Exquisite tenderness** over the linear tendon
(2) **Flexion-spasm** of the finger

(3) **Exquisite pain on passive extension**
(4) **Painful active movements**
(5) Swelling:
(a) Along the linear tendon
(b) Fullness below the annular ligament:
: In radial or ulnar bursitis
(c) Hourglass swelling:
: If forearm pronator space affected

Diff. diag: (1) **Fascial space infection:**
(a) Swelling more marked
(b) **Movements less affected**
(c) Tenderness and pain less
(2) **Tenosynovitis:**
(a) Swelling less marked
(b) Movements more affected
(c) Pain, tenderness and **spasticity** +
(3) **Lymphangitis:**
(a) Insignificant primary focus
(b) **Red streaks**
(c) Superficial, rapidly ascending
(d) Tender glands
(e) General toxæmia
(4) **Osteomyelitis;**
(a) Affection of the **whole circumference**
(b) Signs within the confines of the bone
(c) Subacute or chronic course with **sinus**

Compl: (1) **Extension:**
(A) **Tendons:**
(a) Little finger → ulnar bursa
(b) Thumb → radial bursa
(B) **Fascial spaces:**
(a) Ring and middle fingers
↓ Mid palmar space
(b) Index finger → thenar space
(c) Ulnar or radial bursæ
↓ Pronator space
(C) **Bones:** Osteomyelitis
(2) **Sloughing:** Of the tendons
(3) **Adhesions and contractures**

Treat: (1) Pre-operative: Heat
Bier
Elevation with rest
General: sulphonamides
(2) Operative: **Early incision and evacuation**
Tech: (a) General anæsthesia
(b) Tourniquet

(c) Incisions:

(α) Fingers:

: Ant. lateral on either side of the phalanx avoiding joints

(β) Radial bursa:

: Antero-lateral on the thumb

↓ Thenar eminence

↓ Upto 1" distal to annular lig.

(γ) Ulnar bursa:

: Radial side of hypothenar

↓ Through the annular lig.

(δ) If fascial spaces infected:

: Carry the incisions into them

(d) Avoid: nerves, vessels, bones, joints

(3) Post-operative:

(A) Immediate:

(a) Mag. sulph.-glycerine pack

(b) Fixation:

By: Plaster splint

In: Physiological position

For: 48 hours

(B) After 48 hours:

(a) **Hypertonic baths and packs**

(b) **Active movements**

(c) Rest in physiological position:

: Splint and sling

(d) **Bier's hyperæmia**

(C) General chemo-therapeutic measures:

: Sulphanilamides

(E) PHALANGEAL WHITLOW:

Phalangeal osteomyelitis and necrosis

Def: Pyogenic osteoperiostitis of phalanges

Etio: (1) **Secondary:**

: To every other form of hand infection

(2) Primary: traumatic infection

: specific with secondary infection

Clinic: (1) Primary focus: in secondary cases

(2) Subacute or chronic intractable course

(3) Affection of the **whole circumference**

(4) Presence of **sinuses**

Treat: (1) **Curettage**

(2) Excision

(3) Amputation: avoid as far as possible

(F) LYMPHANGITIS:

Etio: (*a*) **Portal of entry**: Insignificant
- (α) Abrasions
- (β) Pricks

(*b*) Virulence and kind of organisms:
: Streptococcus

(*c*) General susceptibility

Clinic: (1) Insignificant inflammatory focus
↓ (2) **Red ascending streaks**
+ (3) **Regional lymphadenitis**
+ (4) General toxæmia: marked

Compl: (1) **Lymphadenitis**
(2) **Cellulitis**
(3) Bursitis: olecranon, acromial
(4) General: (*a*) Toxæmia
(*b*) **Septicæmia**

Treat: (1) Prophylactic: **immediate squeezing of all punctured wounds**
(2) Curative:
(A) Local: (1) **Absolute rest** in sling
(2) Arm baths
(3) Bier
(4) **No operation**
(3) General: (1) **Sulphonamide** group
(2) Antisera

(II) CHRONIC INFECTIONS OF THE HAND:

(A) SECONDARY TO ACUTE INFECTIONS:

Etio: (1) Too late treatment
(2) Badly placed drainage
(3) Sloughing of tissues
(4) Implication of bones

(B) SPECIFIC INFECTIONS:

(1) TUBERCULOUS MANIFESTATIONS:

(*a*) **Verruca necrogenica**: (See under *skin*)
(*b*) **Tuberculous tenosynovitis**:

Syn: Compound palmar ganglion
Etio: (*a*) Chronic strains and sprains
(*b*) Age: 18–35
Path: (*a*) **Fungous** type
(*b*) **Serous** type
Clinic: (*a*) Insidious origin and progress
(*b*) Fungous:
: Semisolid, puffy, pulpy mass with **multiple sinuses**, fungoid granulations and adhesions.
or (*c*) Serous: Fluctuating **hourglass swelling** on the ventral aspect of the wrist

Treat: (A) Conservative:
- (1) Bier's hyperæmia
- (2) Plaster-of-Paris with Winnet Orr

(B) Operative:
- (1) Incision:
  - : 1·5" above the annular ligament
  - ↓ Level of superficial palmar arch
- ↓ (2) Curettage
- or (2) Excision of all affected material
- ↓ (3) BIPP

(C) Post-operative:
- (1) Cock-up splint or Plaster-of-Paris
- (2) Bier's hyperæmia
- (3) Active movements
- (4) General treatment

(c) **Tuberculous dactylitis:** (See under Bones)

(d) **Tuberculous onychia:**
: Indolent ulcer with shed nail

(2) SYPHILITIC MANIFESTATIONS:

(a) **Syphilitic onychia:**

(α) **Primary chancre:**
- (a) **Chronic indolent ulcer**
- +(b) Enlarged regional glands
- (c) W.R.
- (d) Therapeutic test

(β) **Secondary onychia and paronychia:**
- (a) Dry, brittle nails
- (b) Thick, red fissures around the nails

(γ) **Congenital syphilitic onychia:**
- (a) Sero-pus under nail
- ↓ (b) Shed nail

(b) **Syphilitic Tenosynovitis:**
: Indolent, painless, serous

(c) **Syphilitic dactylitis:** (See under Bones)

(3) GONORRHŒAL TENOSYNOVITIS: Rare

Clinic: (1) Subacute tenosynovitis
(2) Urethral discharge or history of gonorrhœa

Compl: Adhesions and contractures

Treat: Early mobilisation

(IV) GANGRENE OF THE HAND: (See under Gangrene)

(A) CIRCULATORY:
- (1) Impaired general circulation
- (2) Thrombosis
- (3) Embolism

(4) Ligations
(5) **Pressure on main artery:** Around elbow
  (a) Traumatic: fractures, dislocations, hæmatomas
  (b) Therapeutic: tight bandages, splints, plasters
(6) **Injury to the main artery:**
  : Indirect traumatic gangrene
(7) Senile
(8) Thrombo-angiitis obliterans
(9) **Raynaud:** Vasospasm

(B) NEUROGENIC:
  : **Trophic ulcers:** (a) Leprosy
    (b) Paralysis: bed-sores
    (c) Central nervous diseases

(C) INFECTIVE.
  (1) **Acute inflammations:** Sloughing tendons
  (2) **Anærobic** infection

(D) DIRECT TRAUMATIC: Crushes, pulping

(E) PHYSICAL AND CHEMICAL:
  (1) **Burns**
  (2) Frost bite
  (3) Escharotics: carbolic acid, tinct. iodine
  (4) **Scorpion bite:** In some cases

(F) DIABETIC

(V) NEW GROWTHS OF THE HAND:

(1) **Warts and corns:** (See under Skin)
  : Molluscum contagiosum

(2) **Cystic swellings:**

  (A) **Post-traumatic epidermoid cyst:**

Syn: Implantation cyst or dermoid
Etio: Trauma: pricks
Path: Lined by squamous epithelium
Clinic: Rapidly enlarging, subcutaneous cysts on the palmar aspect of hand and fingers
Treat: Excision

  (B) **Ganglion:** (See under Muscles and Tendons)

  (C) **Pseudo-bursa:**

Def: An adventitious bursa overlying an undue prominence of a bone
Site: Base of 2nd or 3rd metacarpal (on the dorsum)

(3) **Exostoses:**

Sites: Bases of 2nd or 3rd metacarpals
Compl: Adventitious bursitis

(4) **Enchondroma:** Multiple: (See under Bones)

(5) **Fibroma**

(6) **Lipoma:** (*a*) Under the palmar fascia
(*b*) Macrodactyly

(7) **Sarcoma:** From the skin or metacarpal bone

(8) **Melanoma: Melanotic whitlow**
: Near about the nail.

(VI) DEFORMITIES OF THE HAND:

(A) CONGENITAL: (See above)

(1) **Polydactylism**
(2) **Syndactylism**
(3) **Macrodactylism**
(4) **Congenital contracture:** Of little finger

(B) ACQUIRED:

(1) **Dupuytren's contracture:**
: (See under Muscles and Tendons)

(2) **Volkmann's ischæmic contracture:**
: (See under Muscles and Tendons)

(3) Main-en-griffe } **claw hand**—ape hand
↓ Main-en-singe
(See under Nerves)

Etio: (*a*) **Ulnar nerve paralysis**
(*b*) Paralysed ulnar + median

Clinic: (1) **Flat palm:** With prominent bones
(*a*) Thenar atrophy
\+ (*b*) Hypothenar atrophy
(2) **Deformity:**
(*a*) Metacarpo-phalangeal hyperextension
\+ (*b*) Inter-phalangeal flexion

(4) **Mallet or baseball finger:**
: (See under Muscles and Tendons)

(5) **Trigger finger:**

Etio: Sprain

Path: (1) Stenosing tendo-vaginitis
(2) Rupture middle slip of extensor
(3) Extensor sheath affection:
(*a*) Ganglion
(*b*) Sesamoid
(*c*) New growth
(*d*) Osteo-arthritic

Clinic: (1) Flexion: with inability of voluntary active extension
(2) Passive extension with a snap

Treat: (1) Removal of etiology
(2) Division of thickened tendon sheath

(B) PAIN IN THE UPPER EXTREMITY

(1) PAIN IN THE SHOULDER:

(A) DIRECT CAUSES:

(1) **Trauma:** To
- (*a*) Joints: (α) Sprain
  - (β) Synovitis
  - (γ) Adhesions
- (*b*) Muscles and tendons: rupture
  - : (α) Supraspinatous
  - (β) Biceps
- (*c*) Bones: fracture

(2) **Arthritis:**
- (*a*) Traumatic
- (*b*) Infective
- (*c*) Specific
- (*d*) Osteo-arthritic

(3) **Fibrositis and fascitis:**
- (*a*) Rheumatic
- (*b*) Gonorrhœal

(4) **Myositis:**
- (*a*) Infective
- (*b*) Rheumatic

(5) **Bursitis:** Sub-acromial, sub-deltoid

(6) **Neuritis**

(7) **Occupational**

(B) REFERRED CAUSES:

(1) **Cardio-vascular lesions:** Angina pectoris

(2) **Intra-thoracic lesions:** Pleural affections
New growths

(3) **Gastric lesions:** Flatulence
Gastric ulcer or cancer

(4) **Duodenal lesions:** Catarrh
Ulcer

(5) **Hepatic lesions:** Hepatic engorgement
Hepatitis or hepatic abscess

(6) **Gall bladder lesions:** Cholecystitis
Cholelithiasis

(7) **Pancreatic lesions:** Chronic pancreatitis
Carcinoma pancreas
Pancreatic cyst

(8) **Diaphragmatic lesions:**
: Subdiaphragmatic abscess
Hepatic, splenic or pleural adhesions

(9) **Nervous lesions:** (*a*) Spinal:
- (α) Caries
- (β) Growth
- (γ) Pachymeningitis

(*b*) Cervico-brachial neuralgia

(2) PAIN IN THE UPPER LIMB:

(1) **Brachial neuralgia:**

Etio: (*a*) Rheumatic
(*b*) Gouty
(*c*) Influenzal
(*d*) Malarial
(*e*) Alcoholic
(*f*) Diabetic

Clinic: (1) Pain and tenderness in the distribution of the brachial plexus
(2) **No muscular paralysis or atrophy**
(3) **No sensory loss**
(4) **No reflex cause**

(2) **Brachial neuritis:**

Etio: **Pressure on or irritation of nerve trunks:**
Due to: (*a*) Tumour or glands in the neck
(*b*) **Cervical rib**
(*c*) Subclavian aneurysm
(*d*) Tumour or glands in the axilla

Clinic: (1) Pain and tenderness
(2) Muscular paresis and atrophy
(3) Sensory loss
(4) Presence of some causative focus

(3) **Radicular pain:** 5C to 2D

Etio: (1) **Spinal affections:**
(*a*) Gliosis
(*b*) Tumour
(*c*) Pachymeningitis
(2) **Vertebral affections:**
(*a*) Trauma
(*b*) Caries
(*c*) New growth
(3) **Herpes zoster**

Clinic: (1) Deformity, rigidity and tenderness of **vertebra**
(2) Other **root** symptoms: paralysis
root pains
loss of tendon reflex
(3) **Spinal** pressure symptoms: spastic paraplegia
(4) Oculo-pupillary phenomena: 8C + 1D

(5) **Occupation neuroses:**

Etio: Certain occupations:
: Writing, typing, needlework, telegraphy, hair-cutting.

Clinic: Painful cramps with history of occupation

(6) **Referred visceral pain:**

(1) Heart: **angina pectoris**
(2) Aorta: aneurysm

(7) **Tabetic crises**

(C) DEFORMITIES OF THE UPPER EXTREMITY

(1) SPRENGEL'S SHOULDER:

Def: **Congenital elevation and rotation of scapula**

Etio: ? Intra-uterine compression

Clinic: (1) Short neck
(2) Scapula above the level of the clavicle
(3) Limitation of arm movements

Treat: Conservative:
(*a*) Massage, exercises
↓ (*b*) Correction → plaster fixation → physiotherapy

(2) CUBITUS VALGUS:

Def: **Increase in the normal carrying angle of the elbow**

Anat: Normal carrying angle:
Males: 13°
Females: 15°

Etio: **Elbow injuries:**
(1) Separation of lower humeral epiphysis
(2) Fracture lower third of the humerus
(3) Supra-condylar or T fracture
(4) Fracture either condyle
(5) Osteomyelitis humerus

Clinic: Exaggerated lateral deviation of the forearm from the axis of the arm

Compl: **Tardy ulnar neuritis**

Treat: (1) **Anterior transposition of ulnar nerve**
(2) Supra-condylar humeral osteotomy

(3) CUBITUS VARUS:

Def: Diminution in the normal carrying angle of the elbow

Etio: Elbow injuries: same as valgus

Clinic: Forearm more in line with the arm

(4) CLUB HAND:

Def: Congenital absence of radius with forward and radial displacement of the hand

Clinic: Deformity of the hand
Treat: (1) Repeated manipulations → plaster fixations
(2) Bone-graft
(3) Ulna split

(5) DEFORMITIES OF THE HAND: (See under Hand)

IMPORTANT POINTS

(A) Trauma:

(1) Punctured wounds:

(1) Complications:
- (*a*) Retention of foreign bodies: needles
- (*b*) Infection: septic pricks
- (*c*) Hæmorrhage
- (*d*) Anærobic infections

(2) Treat: (*a*) Immediate squeezing:
: Of three drops of blood
(*b*) Prophylactic anti-serum + sulphonamide
(*c*) Local rest

(2) Needle in the palm:

- (*a*) Never attempt to remove a needle from the palm under short anæsthesia. Local or general anæsthesia for quite a long time is usually required.
- (*b*) Never be in a hurry while searching for the foreign body; it will only make a mess of the operation.
- (*c*) Either mark the position of the needle under screen or take X-Ray plates in two planes before every operation for removal of a needle.
- (*d*) Incise across the long axis of the needle and not parallel to it.
- (*e*) Tip of the small finger is the best feeler for a needle; blunt dissection forceps is the next best.
- (*f*) A fibrous cord or a deep ligature may give a false sensation of a foreign body.

(3) Wrist cut:

- (*a*) It is impossible to divide the flexor tendons by a transverse cut just above the wrist without dividing the median nerve or the ulnar nerve.
- (*b*) Even if both the median and ulnar nerves are divided at the wrist, fingers can be flexed if tendons are intact.
- (*c*) Hand should in all cases be tested for sensations and movements of individual tendons, after every open wound of the wrist, especially on the flexor side.

(4) Hæmorrhage:

: Uncontrollable hæmorrhage from below the wrist is best treated by ligature of brachial artery. Ligatures of radial and ulnar combined are not sufficient.

(5) **Sequelæ:**
: Anchoring adhesions within tendon sheaths are one of the chief causes of disability following hand injuries and the best method of preventing them is: gentle technic + early mobility.

(6) We should regard all but the most trivial injuries of the hand and fingers as major surgical emergencies calling for expert treatment. Kanavel would rather have the average surgeon operate on him for acute appendicitis than for the repair of a divided flexor tendon.

(B) **Infection:**

(1) **Main classification** of hand infections:
- (1) Minor:
  - (a) Onychia and paronychia
  - (b) Subcuticular whitlow
  - (c) Subcutaneous whitlow
  - (d) Minor lymphangitis
- (2) Major:
  - (a) Tenosynovitis
  - (b) Fascial and bursal infections
  - (c) Osteomyelitis
  - (d) Lymphangitis
  - (e) Cellulitis.

(2) In hand infections, point of maximum tenderness is a guide to the maximum concentration of pus and to the compartment affected.

(3) **Swelling on the dorsum:** Of the hand in cases of hand infections is nearly always due to secondary œdema and only very rarely requires incisions.

(4) **Chief diagnostic points:** Of different hand infections:
- (1) Fascial space infection:
  - (a) Swelling: +
  - (b) Spasm and immobility of tendons: —
- (2) Tenosynovitis:
  - (a) Swelling: —
  - (b) Spasm and immobility of tendons: +
- (3) Lymphangitis:
  - (a) Ascending superficial swelling with red streaks
  - (b) Spasm and immobility of tendons: —

(5) **Treatment points:** In different hand infections:
- (1) Fascial space infection: Choose your own time
- (2) Tenosynovitis: Drain at the earliest opportunity
- (3) Lymphangitis: Never operate.

(6) **In pulp space infection:** The chief complications are:
- (a) Osteomyelitis and necrosis of ungual phalanx
- (b) Tenosynovitis

These complications can be avoided by correct methods of drainage at the correct time. Drainage must be early; do not wait for fluctuation.

(7) **Acute suppurative tenosynovitis:**

Etio: (*a*) Punctured wounds
(*b*) Terminal pulp infection with its faulty treatment

Compl: (*a*) Tendon necrosis
(*b*) Fascial space suppuration
(*c*) Bone necrosis

Common infective agent is streptococcus hæmolyticus. Most important cause of poor results is delay before operation.

(8) **Tendon sheath infections:**

Clinic: (1) Uniform linear swelling of the whole finger
(2) *Exquisite tenderness over the line of tendon*
(3) Flexion of the finger
(4) Extremely painful passive extension

(9) Infection of the **sheaths of the thumb and the little finger** is much more dangerous than the infection of other finger sheaths, due to the continuity with common ulnar and radial bursæ of the former sheaths.

(10) Differential diagnosis between **Pulp abscess and lymphangitis**

	Pulp abscess	*Lymphangitis*
Throbbing	+	—
Swelling	+	—
Tenderness	+	—
Red lines	—	+
Toxæmia	—	+

(11) Obliteration of palmar hollow is pathognomonic of *middle* palmar space infection.

(12) Hourglass swelling with flexion-spasm of the wrist is pathognomonic of compound *palmar bursitis with pronator* space infection.

(13) **Pre and post operative treatment** in hand infections:

(A) *Pre-operative:*
(*a*) Bier's hyperæmia
(*b*) General anæsthesia
(*c*) Tourniquet

(B) Post-operative:
(*a*) Bier's hyperæmia

(b) Hypertonic dressings:
Baths: Hypertonic saline or mag. sulph.
Packs: Mag. sulph.-glycerine

(c) Rest: by: plaster or wooden splint and a sling
in: physiological wrist position.
: (cricket-ball-grasp)

(d) Early active movements.

(14) Beware of secondary hæmorrhage in hand infections and their treatment.

(15) Avoid hot moist dressings in hand infections.

(16) Most common **causes of gangrene finger are:**
(a) Trauma round about elbow and its treatment
(b) Pulping of the hand. direct traumatic
(c) Acute infective gangrene
(d) Trophic gangrene. leprosy
(e) Scorpion bite: (author has seen three cases of dry prolonged gangrene)
(f) Raynaud
(g) Diabetes

(17) **Chronic bone affections** in hand:
(1) Chronic septic necrosis
(2) T. B. dactylitis
(3) Syphilitic dactylitis.

(C) Operations on hand:

(1) Conservative surgery is the best surgery in hand.

(2) Thumb is the most important finger and utmost conservatism should be followed in thumb surgery.

(3) A hand without a thumb lacks about half its usefulness. A hand without a thumb and an index finger lacks most of its usefulness. Loss of distal tip of any finger is a lamentable loss to skilled workers. A single finger or adequately functioning stump thereof is considerably better than any artificial hand.

(4) Amputation of a single finger with the metacarpal head is preferable to amputating a large portion of the finger.

(5) Loss of metacarpal head does not seriously weaken the hand and produces less deformity.

(6) Painful stumps after digital amputations are usually due to amputation-neuromata of the digital nerves
Diff. diag. of painful stumps:
(1) Amputation neuroma
(2) Amputation osteitis
(3) Traumatic neurosis
Treatment of amputation neuroma is its excision [illegible] inch of the digital nerve.

(7) Steps of operative treatment of hand trauma:
- (1) Thorough exploration
- (2) Debridement
- (3) Arrest of hæmorrhage
- (4) Repair of torn tissues
- (5) Sutures or skin graft
- (6) Post-operative: (*a*) Position
  (*b*) Movements

(D) Deformities of the hand:

(1) Tissue classification:
- (1) Skin: burns scar
- (2) Palmar fascia: (*a*) Congenital
  (*b*) Dupuytren
- (3) Tendons: sloughing, adhesions
- (4) Muscles: Volkmann
- (5) Nerves: paralysis, irritations, trophic
- (6) Bones: (*a*) Congenital: manus valgus
  (*b*) Traumatic: mal-union of fractures.

(2) Causes of claw hand:
- (*a*) Ulnar paralysis (trauma, leprosy, neuro-fibroma)
- (*b*) Cervical rib
- (*c*) Syringomyelia
- (*d*) Acute anterior poliomyelitis
- (*e*) Progressive muscular atrophy
- (*f*) Amyotrophic lateral sclerosis

(3) Causes of thenar atrophy without sensory disturbances:
- (*a*) Occupational: gardeners, charwomen
- (*b*) Gouty median neuritis
- (*c*) Arthritic: trapezio-metacarpal
- (*d*) Senile

(E) Miscellaneous:

(1) Causes of **bony swellings** in hand.
- (1) Trauma: callus, mal-united fracture
- (2) Sepsis: septic osteoperiostitis
- (3) Specific: (*a*) Tuberculous dactylitis
  (*b*) Syphilitic dactylitis
- (4) New growths: (*a*) Enchondromata
  (*b*) Exostoses
- (5) Congenital: macrodactyly
- (6) Hormonic: gigantism

(2) **Spindle-shaped bony swellings:**
- (1) Tuberculous dactylitis
- (2) Syphilitic dactylitis
- (3) Enchondromata

(3) [illegible]

(3) Multiple exostoses
(4) Multiple enchondromata of the hand

(4) Do not forget **leprosy** in any ulcerous or trophic condition of the hand.

(5) Causes of axillary swellings:
(1) Enlarged lymph glands:
(*a*) Septic
(*b*) Tuberculous
(*c*) Lymphadenomatous
(*d*) Secondary carcinomatous
(2) Abscess: (*a*) Acute
(*b*) Cold: (1) Lymphadenic
(2) Ribs or spine
(3) Neck
(4) Breast
(5) Empyema necessitatis
(3) Primary tumours of the axilla:
(A) Lipoma: subpectoral
(B) Cystic hygroma
(C) Sarcoma
(D) Carcinoma of axillary tail of the breast
(E) Aneurysm of the axillary artery.

CHAPTER IX

THE LOWER EXTREMITY

I. DEFORMITIES OF THE LOWER EXTREMITY:

(A) DEFORMITIES AT THE HIP REGION:

(1) CONGENITAL DISLOCATION OF THE HIP:
(See under Hip Joint)

(2) COXA VARA:

Def: Diminution in the angle between the neck and the shaft of the femur

Etio: (1) **General bone diseases**
(2) **Local bone diseases**
(3) **Trauma:**
(A) Acute: mal-united fracture
(B) Chronic: slipped epiphysis

Clinical types:

(A) **Adolescent or epiphyseal** Coxa vara:

Etio: **Boys between 10 and 16**
Bilateral

Causes: (1) **Trauma:**
(*a*) Non-traumatic
(*b*) Pre-traumatic
(*c*) Traumatic
(*d*) Post-traumatic
(2) **Infection:** Low grade

Path: (A) Factors:
(*a*) Endocrine disorder:
: Pituitary dysfunction
(*b*) Muscular traction
(*c*) Trivial trauma
(B) Path-anatomy:
(*a*) Backward rotation of the epiphysis
\+ (*b*) External rotation of lower limb

(B) **Infantile or cervical** Coxa vara:

Etio: **Girls between 5 and 11**

Causes: (1) **Trauma:** Partial fracture of the femoral neck
(2) **Developmental error:** Fairbank
: Separate diaphysial spur of Walmsby
(3) **Rickety**
(4) **Congenital**

Clinic. (1) **Children between 5 and 14**

(2) **Limping**

(3) Pain and spasm in hip joint:
: Slight, initial or recurrent

(4) Inspection:
(A) **Limb: adducted + everted + shortened**
(B) **Great troch.: Elevated and prominent**

(5) Palpation:
. Great trochanter elevated and prominent

(6) Movements:
(A) Chronic stage:
(*a*) **Limitation of:**
: Abduction and inversion
(*b*) Exaggeration of:
: Adduction and flexion
(B) Acute traumatic stage:
: Limitation of all movements

(7) Measurements:
(A) Short leg:
. Ant. sup. spine → medial malleolus
(B) Elevated trochanter:
(*a*) Nelaton's line
(*b*) Bryant's △
(*c*) Cheine's parallels
(*d*) Shoemaker's lines
(*e*) Morris' bitrochanteric distances
(*f*) Trendelenburg's sign

(8) Spinal compensatory deformity:
: Scoliosis, lordosis

(9) X-Rays.

Planes. (*a*) Antero-posterior
(*b*) Lateral

Changes: (1) **Altered contour of the neck:**
. Upper border of the neck is to the head:
(*a*) At tangents
(*b*) In transverse line
(*c*) In convex line
at: (α) Junction of head and neck
or (β) Junction of neck and trochanter

(2) **Epiphysial changes:**
(*a*) Fluffiness
(*b*) Vertical plane
(*c*) Separate diaphysial spur

(3) Changes in the bone texture
(4) Mal-united fracture femoral neck (in traumatic cases)

Diff. diag: (1) **Tuberculous hip**
(2) Congenital dislocation of the hip
(3) Traumatic arthritis
(4) Infective arthritis
(5) Paralysis: infantile, spastic

Treatment:

(A) **Early cases:**

(1) (*a*) **Rest in bed:** For 6 months
↓ (*b*) Crutches: for 6 months
↓ (*c*) Calliper splint: for 24 months

(2) (*a*) **Skeletal traction:**
By: Kirschner's wire
Through: (α) Lower end of femur
(β) Tibial tubercle
In: 25° abduction
With: 15–20 lbs. weight
For 8 weeks
↓ (*b*) Rest in bed: for 2 weeks
↓ (*c*) Walking calliper: for 24 weeks

(3) **Light traction on frame or sliding bed:**
For: (*a*) 6–12 months
(*b*) Till X-Ray shows fusion

(4) (*a*) Anæsthesia
↓ (*b*) Manipulative abduction
↓ (*c*) **Plaster fixation:** For 6 months
↓ (*d*) Walking calliper

(5) Operative fusion: **Epiphysiodesis**
(*a*) Multiple drilling
(*b*) Tibial bone graft
(*c*) Three-flanged nail

Do not allow the patient to leave the hospital until the epiphysis has fused

(B) **Late cases: Operative treatment**
Ind: (1) Infantile or cervical coxa vara
(2) Late cases
(3) Marked deformity:
(*a*) Adduction
(*b*) External rotation

(1) **Sub-trochanteric osteotomy of Gant:**
(*a*) Osteotomy at the level of trochanter minor:
(α) Simple
(β) Wedge shaped

↓ (b) Adductor tenotomy
↓ (c) Fixation:
By: Plaster-of-Paris
In: Extreme abduction
For: 3 months
↓ (d) Walking calliper

(2) **Excision of femoral head:**
(a) Excise the head of the femur
↓ (b) Fixation.
By: Plaster-of-Paris
In: Abduction and hyperextension
For: 6 months

(3) **Bifurcation osteotomy of Lorenz**

(B) DEFORMITIES AT THE KNEE REGION

(3) GENU VALGUM: Knock knee

Etio: (1) **Static:**
(a) Deficient postural activity:
: (Lax muscles and ligaments)
+ (b) Improper attitudes

(2) **Compensatory:**
(a) Hip deformities
(b) Foot deformities

(3) **General bone diseases:**
(a) Rickets
(b) Osteomalacia

(4) **Local bone diseases:**
(a) Mal-united fracture
(b) Separated epiphyses

(5) **Renal dwarfism:** (See under Kidney)
(a) Knock-knee
+ (b) Nephritis
+ (c) Dwarfism

Path. **Body weight transmitted through outer knee**
↓ (a) Overstretching of inner ligaments and tendons
+ (b) Contraction of outer ligaments and tendons
+ (c) Bending of adjacent portions of shafts of bones
+ (d) Changes in the texture of bones and epiphyses:
(α) Internal hypertrophy. irritation
(β) External atrophy: pressure
+ (e) Compensatory deformities:
(α) Flat foot
(β) Bowed tibia
(γ) Coxa vara
(δ) Scoliosis

Sites : (1) Lower end of the **femur**
(2) **Knee** joint
(3) Upper end of the **tibia**

Clinic : (1) Time . toddling period
(2) Abnormal gait : **Fatigue gait**
(3) **Abnormal posture :**
(A) *With knees extended :*
Hip · Flexed
Femur : Inverted and adducted
Knee . Slightly flexed and abducted
Tibia : Everted and abducted
Feet . Everted and flat
(B) *With knees flexed .*
: Whole deformity disappears

Compl (1) **Compensatory deformities :** (See above)
(2) **Dislocation patella**
(3) Osteoarthritis
(4) Flail joint

Treat : (A) **Small children : Conservative :**
(1) Treat the underlying cause
(2) Massage, movements, physiotherapy
(3) Splints
(*a*) Thomas' external steel bar
(*b*) Ext. splint from troch. to boots

(B) **Older children :**
(1) **Repeated moulding**
↓ Plaster fixation
(2) **Manual osteoclasis :** Under anæsthesia
↓ Plaster fixation
↓ Physiotherapy

(C) **After the age of 4 :**
(1) **Osteoclasis :**
(*a*) Manual : before the age of 4
(*b*) Osteoclastic : between 4 and 8
(*c*) Open : after the age of 8
(2) **Osteotomy :**
Tech : (*a*) Linear
(*b*) Cuneiform
Sites : (*a*) Lower end of femur :
: '5" front & above adductor tubercle
(*b*) Upper end of tibia :
: below the tibial tubercle

Steps: (a) Incision
↓ (b) Insertion of osteotome → rotation to right angle
↓ (c) Division of bone: anterior→posterior
↓ (d) Manual fracture

Dangers: (1) Hæmorrhage
(2) Epiphysial injury
(3) Joint injury
(4) Sepsis

After-treat: (1) **Splinting:** For ten days
↓ (2) **Fixation:**
By: Plaster-of-Paris
In: Over-corrected position
For: Six weeks
↓ (3) **Walking calliper:** For six months
+ (4) Physiotherapy

(4) GENU VARUM: Bow leg

Etio: (1) **Congenital:** Intra-uterine position
(2) Static
(3) Compensatory
(4) General bone diseases
(5) Local bone diseases
(6) Riding

Varieties (1) **Genu varum:** Deformity of femur and tibia near the knee joint
(2) **Bow leg:** Deformity of shaft ends of tibia and fibula

Path. **Body weight transmitted through inner knee**
↓ (a) Stretching of external ligaments
+ (b) Contracture of internal ligaments
+ (c) Hypertrophy of outer condyles: irritation
+ (d) Atrophy of inner condyles: pressure
+ (e) Compensatory foot deformities.
: Planus or valgus

Clinic: (1) Time: infancy
(2) Abnormal gait: **Rolling gait**
(3) **Abnormal posture:**
Femur. Abducted and everted
Tibia: Adducted and inverted

Compl: (1) **Pes planus**
(2) **Pes valgus**
(3) Dislocation patella
(4) Synovitis or osteoarthritis
(5) Flail joint

Treat: (1) Conservative:
- (A) **Manipulations**
  - + Physiotherapy
  - + Shoes with outside up
- ↓ (B) **Splint** or steel to the inner side of the leg:
  - : For 6 months

(2) Operative:
- Ind: (*a*) Age over 4
  - (*b*) Severe deformity
- (A) **Osteoclasis:**
  - (*a*) Manual: before 4
  - (*b*) Mechanical. between 4 and 8
  - (*c*) Open. after 8
- (B) **Osteotomy:**
  - (*a*) Closed. after 4
  - (*b*) Open in adults
    - (α) Linear
    - (β) Cuneiform

(5) GENU RECURVATUM:

Def: Abnormal hyperextension at the knee joint

Etio: (1) Congenital
- (2) Acquired:
  - (*a*) Infantile paralysis
  - (*b*) Mal-united fracture
  - (*c*) Rupture cruciate ligaments
  - (*d*) Prolonged recumbency: static
  - (*e*) Compensatory: to
    - (α) Talipes equinus
    - (β) Genu valgum

Clinic: (1) Deformity: hyperextended knee joints
- (2) Abnormal gait

Treat: (1) Treatment of etiology
- (2) Conservative:
- (3)
  - : 1″ below knee
  - ↓ (B) Compensatory setting of the fragments
  - ↓ (C) Fixation:
    - By: splint
    - In. (*a*) Knee flexion: for 4 weeks
      - ↓ (*b*) Knee extension: for 4 weeks
  - ↓ (D) Calliper splint. for 12 weeks

(C) DEFORMITIES OF THE LEG

(6) ANTERIOR BOW LEG:

Def: Anterior or antero-external curvature of tibia

Etio: (A) **Gravitational: at the lower third of tibia:**
- (a) Gravity
- \+ (b) Bone softening:
  - (α) **Rickets**
  - (β) Osteomalacia
  - (γ) Osteitis deformans

(B) **Deposition of new bone:**
: At the centre of tibia
: Syphilis: Congenital or acquired

Clinic: (A) Local: Tibia and fibula
- (1) **Forward bending** with lateral flattening
  - (a) Lower third: in gravitational
  - (b) Central: in syphilis
- (2) **Texture alterations:**
  - (a) Buttress in the concavity. rickets
  - (b) Absorption. osteomalacia
    . early osteitis deformans
  - (c) Deposition and eburnation:
    : Syphilis
    : Late osteitis deformans

(B) General: signs of etiological disease

Treat: (1) Treat the etiology
- (2) Osteoclasis: (a) Manual: before 4
  (b) Osteoclastic: between 4 and 8
- (3) Osteotomy: after 8
  - (a) Closed: linear
  - (b) Open: linear or cuneiform

After-treat. Fixation
By: Plaster-of-Paris
In: Corrected position
For: 4 weeks

Post. compl: (1) Fracture
(2) Non-union

(D) DEFORMITIES OF THE FOOT:

Talipes: Pedal deformity

Def: Of primary deformities
- (1) **Talipes equinus:** Plantar flexion at:
  - (a) Ankle
  - (b) Mid-tarsal
- (2) **Talipes calcaneus:** Dorsiflexion at the ankle
- (3) **Talipes varus:**
  - (a) Inversion at: (α) Sub-astragaloid
    \+ (β) Mid-tarsal
  - \+ (b) Adduction at mid-tarsal:
    : (Metatarsus varus)

(4) **Talipes valgus:** Eversion at:
(α) Sub-astragaloid
+ (β) Mid-tarsal

(5) **Pes cavus:** High arch of the foot

(6) **Pes planus:**
: Obliteration of normal arch of the foot

(1) TALIPES EQUINO-VARUS:

Def: (a) Plantar flexion, (b) Inversion, (c) Adduction } of the foot at: { (a) Ankle, (b) Sub-astragaloid, (c) Mid-tarsal

Etio (1) **Congenital**
(2) Hereditary
(3) Boys
(4) Association with other congenital deformities

Path: (1) Theories:
(A) Mechanical
(B) Spasmodic
(C) Arrested development

(2) Cause:
(A) Congenital dislocation or subluxation of astragalo-scaphoid joint → **internal displacement of scaphoid over astragalus**

(B) Metatarsus varus.
: **Want of development of internal cuneiform**

(3) Morb. anat:
(A) **Joints:**
(1) **Ankle joint:** Plantar flexion
(2) **Sub-astragaloid:**
(a) Inversion
(b) Adduction
(3) **Mid-tarsal:**
(a) Plantar flexion
(b) Adduction

(B) **Bones:**
(1) **Astragalus:**
. Head and neck displaced down and in
(2) **Scaphoid:**
: Internal displacement; wedge-shaped
(3) **First cuneiform:**
: Internal displacement; wedge-shaped

(C) **Ligaments:**
(1) **Internal and plantar:** Shortened
(2) **External and dorsal:** Lengthened

(D) **Muscles:**
(1) **Postero-internal group:**
: Contractures
(2) **Extensors + peroneals:** Stretched

(E) **Skin and subcutaneous tissues:**
: **Dorso-lateral region:**
: Irritation, ulcer, callosities

Clinic: (1) Whole foot : Plantarflexion
+ inversion
+ adduction
(2) Fore-foot : Plantarflexion
+ inversion
+ adduction
(3) Heel : Inversion + drawn up
(4) Ankle : Plantarflexion
(5) Sole : Concave and upside
(6) Inner border : Concave and upside
(7) Outer border : Convex and down
(8) Walking on : (*a*) Toes & outer border of foot
↓ (*b*) Dorsum & outer side of foot

Diff. diag:

Congenital	*Acquired*
From birth	Acquired later
Bilateral	Unilateral
No trophic changes	Trophic changes
Primary	Secondary

Treat. (1) **Manipulations: with massage:**
Ind: Within one week after birth
Frequency: Two or three times a day
Method: Correction of:
(*a*) Plantarflexion + adduction
: Of fore-foot
↓ (*b*) Inversion of whole foot
↓ (*c*) Plantarflexion at the ankle

(2) **Manipulations:**
: **With correction-retentive apparatus:**
(*a*) Adhesive strapping
(*b*) Malleable tin splints
(*c*) Plaster beds
(*d*) Special shoes

(3) **Forcible corrections with plaster fixation:**
Ind: (*a*) Child a few months old
(*b*) Resistance to manipulative treatment
Steps: (*a*) Deep anæsthesia
↓ (*b*) Forcible over-correction:
(α) Manual: upto 5 years
(β) Thomas' wrench: after 5 years

↓ (c) Fixation:
  By: Plaster-of-Paris
  In: Over-corrected position
  Extent: (α) Upto lower thigh:
  : With knee at right angles
  or (β) Upto tibial tubercle:
  : If walking to be allowed
  Changes: At monthly intervals

↓ (d) Physiotherapy:
  : With out-wedged shoes

(4) **Operations on soft parts:**

Ind: (a) Age upto 4 years
  (b) Failure of conservatism

(A) **Achilles tenotomy:** (See under Tendons)

(B) **Trethowan:**

  : **Capsulotomy of internal joints**

Tech: (a) Incision:
  . 4" above the ankle to first metatarsal
  Parallel to tibialis posterior
  . Below and parallel to inner bony-margin of the foot
  (b) Detachment of abductor hallucis
  (c) *Forward displacement of long tendons*
  (d) Division of internal ligaments
  (1) Long plantar
  (2) Short plantar
  (3) Calcaneo navicular.
  (α) Superior
  (β) Internal
  (γ) Inferior
  (4) Deltoid
  (5) Internal astragalo calcaneal
  (6) Metatarso-cuneiform
  (7) Scapho cuneiform
  (e) Detachment of origins of.
  (1) Plantar fascia
  (2) Sole muscles
  (f) Stretching the foot in over-correction
  (g) Plaster fixation

After treat: (1) Change of plaster:
  : At the end of two weeks
  ↓ (2) Second plaster: for 12-24 weeks
  ↓ (3) Physiotherapy + outwedged shoes

(C) **Steindler → Trethowan:**

  (1) Steindler: (See page 79)
  (a) Tourniquet

(b) Incision: 2 5"
: ·5" above the sole
: parallel to inner border
: down to os calcis
(c) Division of .
(1) Plantar aponeurosis
(2) Calcaneo metatarsal bands
(d) Reflection anteriorly of all structures on:
(1) Under-surface of os calcis
(2) Inner surface of os calcis
+ (2) Trethowan · (See above)
(D) Transplantation of tibialis anticus
. Into cuboid or base of 5th metatarsal
(See under Tendons)
(E) Bankart silk operation:
· Double-stranded thick silk
From · Base of 5th metatarsal
To . 4" above the ankle
(5) Operations on bones.
Ind · Adults
(A) Elmslie: Osteotomy of (a) Astragaloid neck
(b) Os calcis
(B) Astragalectomy
(C) Cuneiform tarsectomy
(6) Operations on joints ·
· Arthrodesis of (a) Subastragaloid
+ (b) Mid-tarsal

Criterion of cure:
(1) Passive dorsiflexion: 20° beyond right angle
(2) Passive plantarflexion. 60° beyond right angle
(3) Inversion: complete
(4) Eversion: complete

(2) TALIPES EQUINUS:

Etio: (1) Congenital
(2) Acquired:
(A) **Organic**
(a) **Paralytic:**
(α) Central: upper neuron type
(β) Spinal: anterior poliomyelitis
(γ) Peripheral: nerve trauma
(b) Muscles: myopathies
myositis fibrosa
(c) Bones: **Mal-united fractures**
(d) Joints: **Mal-ankylosis**
(e) Skin: cicatricial

(B) **Compensatory :**
: To shortening of the extremity
(C) **Gravitational :** Talipes decubitus
(D) Symptomatic : Tender heel
Hysteria

Path : **Contracture of tendo Achilles :**
(A) Fibrotic
(B) Spasmodic :
(α) Primary
(β) Secondary

Clinic : (A) Limp with :
(*a*) Ankle plantar-flexed
(*b*) Knee flexed
(*c*) Hip flexed
(B) Walking : on toes with heel in mid-air

Compl. (1) Callosities and ulcers on metatarsal heads
(2) Osteoarthritis of the ankle and joints of the foot

Treat : (1) Treat the underlying cause : in secondary cases
(2) Primary cases :
(A) Preventive :
(*a*) Drop-foot right-angled splint
+ (*b*) Physiotherapy
(B) Palliative :
Ind. Shortening less than one inch
Method : Raise the heel of the shoe
(C) Operative :
(1) Soft tissue operations :
(*a*) **Achilles tenotomy :**
: (See under Tendons)
(α) Subcutaneous
(β) Open
(*b*) **Trethowan :**
: Calf-muscle-sliding
(α) Detachment of origins of all calf muscles including gastrocnemius
(β) Sliding and correction of deformity
(2) Bones and joints operations :
(*a*) Osteotomies
(*b*) Excision of the ankle with arthrodesis

(3) PES PLANUS AND VALGUS :

Def : (A) **Pes planus :** Dorsiflexion and abduction of the fore-foot at mid tarsal joint due to weakness of long arch
(B) **Pes valgus :**
: Eversion of the foot at subastragaloid joint

Anatomy & Physiology

(A) *Arches of the foot.*

(1) Long arch of the foot -

(a) Posterior pillar : Calcaneal tuberosity

(b) Keystone : Talus

(c) Anterior pillars :

(α) *Internal* : Navicular
Three cuneiforms
Three internal metatarsals
Three inner toe phalanges

(β) External · Cuboid
Two outer metatarsals
Two outer toe phalanges

(d) Important bony points :

(α) Calcaneal tuberosity

(β) Talus

(γ) Head of first metatarsal

(δ) Head of fifth metatarsal

(2) Transverse arch of the foot :
Site . Necks of all metatarsals

Maintained by Ligaments and small muscles of the sole

(B) *Supports of the foot-arches :*

(1) Tendons .

(a) Peroneus longus

(b) Tibialis posterior

(2) Muscles and fasciae -

(a) Long flexors

(b) Short muscles of the sole

(c) Intermediate planter aponeurosis

(3) Ligaments .

(a) Articular capsule

(b) Interosseous ligaments

(c) Accessory ligaments :

(α) Spring or planter calcaneo-navicular

(β) Long planter

(γ) Short planter

(4) Bones . Constituting the arch

(C) *Maintenance of the arch is done by .*

(1) Muscles :

(a) Postural reflex activity

(b) Voluntary contractions

(2) Ligaments : Attitude ligamentaire
: When muscle tone is exhausted

Path : (1) **Acquired :** Weak or fatigue flat foot

(a) Disturbance between work and rest

↓ (b) Exhaustion of muscles

↓ (c) **Exhaustion of reflex postural activity**

↓ (d) **Attitude ligamentaire**

↓ (e) **Yielding of inner ligaments**

↓ (*f*) **Yielding of inner part of bony arch**
↓ (*g*) **Passive valgus:** pes valgus
↓ (*h*) Mid-tarsal breakdown: pes planus
(α) Fore-foot: abduction + dorsiflexion
(β) Back-foot:
. Adduction + planterflexion + eversion

(2) **Congenital:**
: Diminution in the normal angle (30°) between the neck and body of the astragulus

Clinical types:

(A) (1) **Congenital:**
(*a*) Calcaneo-valgus
(*b*) Valgus
(*c*) Planus

(2) **Infantile:**
: Pes planus
: In fat rickety infants

(3) **Adolescent:** Compensatory to leg deformities

(4) **Menopausal:**
· Chronic foot strain due to obesity

(B) (1) **Acute foot strain:** Athletes
(2) **Sub-acute foot strain:** Convalescence
(3) **Chronic foot strain:** Obesity

(C) (1) **Paralytic:** Infantile paralysis
(2) **Spastic:** (*a*) Short tendo Achilles
(*b*) Spastic peroneals
(3) **Traumatic:** (*a*) Mal-united Pott's fracture
(*b*) Fracture os calcis
(4) **Infective:** (*a*) Tonsil foot
(*b*) Gonorrhœal flat foot
(5) **Ankylosing:** Mal-ankylosis of ankle joint
(6) **Attitudinal:** Ill-fitting boots
(7) **Compensatory:** Genu valgum or varum

Causal types.

(1) **Nervous:** Infantile paralysis, nerve palsies
(2) **Muscular:** Muscle spasm or paralysis
(3) **Ligamentous:** Tonsil and gonorrhœal
(4) **Bony:** Mal-union of fractures
(5) **Joint:** Mal-ankylosis
(6) **Secondary:** (*a*) Compensatory
(*b*) Attitudinal } (See above)

Clinical degrees:

(1) Auto-correction (Voluntary)
(2) Hetero-correction (Involuntary)
(3) Non-correction (Rigid)

Clinics: (A) Symptomless: congenital
(B) With symptoms:

(1) **Faulty gait**
(2) Pain: (*a*) Local: under the neck of the talus and navicular
(*b*) Referred
(3) **Sensation of fatigue**
(4) Tenderness
(5) Rigidity
(6) Swelling: (*a*) Œdema
(*b*) Congestion
(7) Movements:
(*a*) Restriction:
Of: Adduction + plantarflexion
At: Ankle and mid-tarsal
By: (α) **Spasm**
↓ (β) Adhesions
↓ (γ) Adaptive shortenings
↓ (δ) Structural changes
(*b*) Restriction:
Of: Dorsiflexion
At. Ankle
By: Short tendo Achilles

Signs.
(8) **Lowered inner border of the foot**
(9) Transverse spread out of the metatarsals
(10) **Prominent navicular**
(11) **Foot print on floor**

Diff. diag: (1) Rheumatoid arthritis
(2) Osteoarthritis
(3) T. B. tarsus
(4) Other causes of pain and disability of foot

Compl: (1) Hallux:
(*a*) Valgus
(*b*) Flexus
(c) Rigidus
(2) Hammer toes

Treat: (1) **Rest in bed:** For two weeks
Ind: (*a*) Acute foot strain
(*b*) Infective flat foot
(*c*) Spastic flat foot
(2) **Physiotherapy and foot drill:**
Ind: (*a*) Auto-correction
(*b*) Foot strain with free movements*
Contraind: (*a*) Spastic flat foot
(*b*) Infective flat foot

↓ (*f*) **Yielding of inner part of bony arch**
↓ (*g*) **Passive valgus :** pes valgus
↓ (*h*) Mid-tarsal breakdown : pes planus
- (α) Fore-foot : abduction + dorsiflexion
- (β) Back-foot :
  : Adduction + planterflexion + eversion

(2) **Congenital :**
: Diminution in the normal angle (30°) between the neck and body of the astragulus

Clinical types :

(A) (1) **Congenital :**
- (*a*) Calcaneo-valgus
- (*b*) Valgus
- (*c*) Planus

(2) **Infantile :**
. Pes planus
: In fat rickety infants

(3) **Adolescent :** Compensatory to leg deformities
(4) **Menopausal :**
: Chronic foot strain due to Obesity

(B) (1) **Acute foot strain :** Athletes
(2) **Sub-acute foot strain :** Convalescence
(3) **Chronic foot strain :** Obesity

(C) (1) **Paralytic :** Infantile paralysis
(2) **Spastic :** (*a*) Short tendo Achilles
(*b*) Spastic peroneals
(3) **Traumatic :** (*a*) Mal-united Pott's fracture
(*b*) Fracture os calcis
(4) **Infective :** (*a*) Tonsil foot
(*b*) Gonorrhœal flat foot
(5) **Ankylosing :** Mal-ankylosis of ankle joint
(6) **Attitudinal :** Ill-fitting boots
(7) **Compensatory :** Genu valgum or varum

Causal types :
(1) **Nervous :** Infantile paralysis, nerve palsies
(2) **Muscular :** Muscle spasm or paralysis
(3) **Ligamentous :** Tonsil and gonorrhœal
(4) **Bony :** Mal-union of fractures
(5) **Joint :** Mal-ankylosis
(6) **Secondary :** (*a*) Compensatory
(*b*) Attitudinal } (See above)

Clinical degrees :
(1) [illegible] (Voluntary)
(2) [illegible]
(3) [illegible]

Clinics : (A) Symptomless : congenital
(B) With symptoms :

(1) **Faulty gait**
(2) Pain : (*a*) Local : under the neck of the talus and navicular
(*b*) Referred
(3) **Sensation of fatigue**
(4) Tenderness
(5) Rigidity
(6) Swelling : (*a*) Œdema
(*b*) Congestion
(7) Movements :
(*a*) Restriction :
Of : Adduction + plantarflexion
At : Ankle and mid-tarsal
By : (α) **Spasm**
↓ (β) Adhesions
↓ (γ) Adaptive shortenings
↓ (δ) Structural changes
(*b*) Restriction :
Of : Dorsiflexion
At : Ankle
By : Short tendo Achilles

Signs :

(8) **Lowered inner border of the foot**
(9) Transverse spread out of the metatarsals
(10) **Prominent navicular**
(11) **Foot print on floor**

Diff diag : (1) Rheumatoid arthritis
(2) Osteoarthritis
(3) T. B. tarsus
(4) Other causes of pain and disability of foot .

Compl : (1) Hallux :
(*a*) Valgus
(*b*) Flexus
(*c*) Rigidus
(2) Hammer toes

Treat : (1) **Rest in bed :** For two weeks
Ind : (*a*) Acute foot strain
(*b*) Infective flat foot
(*c*) Spastic flat foot
(2) **Physiotherapy and foot drill :**
Ind : (*a*) Auto-correction
(*b*) Foot strain with free movements
Contraind : (*a*) Spastic flat foot
(*b*) Infective flat foot

(4) PES CAVUS:

Def: Rigid exaggeration of longitudinal arch:
With: (*a*) Retraction of toes
(*b*) Depression of anterior transverse arch

Etio: (1) **Inherited**: Bilateral; symptomless
(2) **Adolescent**: Bilateral; neuritic
(3) **Familial**: Bilateral
(4) **Infantile paralytic**: Unilateral
(5) **Acquired secondary**:
(*a*) **Neurogenic**:
(α) Central
(β) Spinal
(γ) Peripheral
(*b*) **Muscular**:
(α) Spastic
(β) Paralytic
(γ) Contractures
(*c*) **Compensatory**: Short leg
(*d*) **Foot-wear**

Path: **Duchenne's theory**:
(1) (*a*) Transient paralysis of intrinsic muscles
↓ (*b*) Uncontrolled long extensors and flexors
↓ (*c*) Metatarso-phalangeal over-extension
↓ (*d*) Depression of anterior transverse arch
(2) Contracture and wasting of sole muscles

Clinic: (1) Plantar flexion of fore-foot over the back-foot
(2) Metatarso-phalangeal over-extension
(3) Depression of anterior transverse arch
(4) Hammer toes
(5) Stiffness and sense of fatigue

Compl: (1) Hammer toes
(2) Metatarsalgia
(3) Adventitious bursæ, callosities, corns, ulcers

Treat: (A) **Treat the underlying etiology**
(B) Local:
(1) **Preventive and conservative**:
(*a*) Daily **passive manipulations**
(*b*) Active exercises
(*c*) Faradic stimulation
(*d*) Night splints: foot: right angled and valgus
toes: flexed and straight
(*e*) **Shoes**: (α) **Metatarsal bars**
(β) Outside wedges

(2) **Operative:**

(A) **Foot:**

(1) **Subcutaneous division of plantar fascia**

↓ Manipulative flattening

↓ Fixation:

By: Plaster-of-Paris

In: Corrected position

For: 6 weeks

(2) **Steindler's operation:**

Ind: (*a*) Marked deformity

(*b*) Older children → young adults

(3) **Steindler + Trethowan:** (See Equino-varus)

↓ Fixation ·

By: Plaster-of-Paris

In: Corrected position

For: 6 weeks

Ind: Severe cases

(B) **Toes:** (See under Deformities of Toes)

Group I: High arch + tight plantar fascia in paralytic children

Treat: (1) Steindler

↓ (2) Plaster fixation: for 3 weeks

↓ (3) Shoes with low heel

Group II: Broad fore-part + depressed metatarsal arch

Treat: (A) Steindler → plaster for 3 weeks

↓ (B) Tendon transplant. of ext. dig long. to metatarsal necks

+ Metatarso-phalangeal capsulotomy (2nd and 3rd toes)

↓ Plaster for 12 weeks

Group III: High arch + bone deformity

Treat: (A) Steindler

↓ (B) Wedge osteotomy: after 3 weeks; on outer side

↓ (C) Plaster fixation: for 12 weeks

Stages of pes cavus with their treatment. (Med. Ann. 1930)

(1) First stage:

Path: Short tendo Achilles

Treat: (*a*) Stretching of tendo Achilles

+ (*b*) Metatarsal bar

(2) Second stage:

Path: (*a*) Short tendo Achilles

+ (*b*) Hammer great toe

Treat: (*a*) Subcutaneous tenotomy of plantar fascia

+ (*b*) Extensor hallucis transplantation

+ (*c*) Wrenching of the high arch

(3) Third stage:

Path: (*a*) High arch

+ (*b*) All toes clawed

Treat: Steindler

(4) Fourth stage:
  Path: (a) High arch
   + (b) Hammer toes
   + (c) Mid-tarsal varus
  Treat: Wedge resection
. (5) Fifth stage.
  Path. Paralytic foot
  Treat. (a) Lisfranc amputation
   + (b) Astragalectomy

(5) DEPRESSED ANT. TRANSVERSE ARCH:

Syn. Transverse flat foot

Anatomy: Arch formed by heads of all metatarsals
  Pillars formed by:
  (1) First metatarsal head
  (2) Fifth metatarsal head

Etio: (1) Improper foot-wear
  (2) Pes cavus
  (3) Rheumatoid arthritis

Path. (a) Inability of toes to flex
  ↓ (b) Hyperextension at metatarso-phalangeal joints
  ↓ (c) Depression of transverse arch
  ↓ (d) Body-weight on middle metatarsal heads
  ↓ (e) Compression of plantar nerves

Clinic: Intermittent neuralgia in connection with 4th toe only when shoe is worn. (Morton's metatarsalgia)

Compl: (1) Callosities, bursæ, corns, ulcers:
  : Under metatarso-phalangeal joints
  (2) Morton's metatarsalgia

Treat: (1) **Conservative:**
  (A) Foot-wear:
   (a) **Metatarsal bar** } behind metatarsal
   (b) Insole } necks
  (B) Metatarsal **strapping**
  (C) Manipulations under anæsthesia

 (2) **Operative:**
  : **Extensor tenotomy**
  ↓ Fixation of the toes:
   By: Plaster-of-Paris
   In: Full flexion
   For: 4 weeks
  ↓ Physiotherapy

 (3) **Morton's metatarsalgia:**
  (a) Conservative: shoes, strapping, supports
  (b) Operative:
   : **Excision of 4th metatarsal head**

(E) DEFORMITIES OF THE TOES:

(1) HALLUX VALGUS:

Def: Lateral deviation of the great toe from its alinement with the first metatarsal, at the metatarso-phalangeal joint

Etio: (1) Metatarsus atavicus
(2) Short and pointed boots
(3) Improper walking

Path: (*a*) Lateral deviation of the great toe from first metatarsal
+ (*b*) Mesial deviation of first metatarsal from the second
↓ (*c*) External displacement of long tendons of the great toe
↓ (*d*) Loss of support to the long arch
↓ (*e*) Flat foot
+ (*f*) Depression of anterior transverse arch
+ (*g*) Hammer toes

Clinic: Deformity: (1) *Primary: hallux valgus*
(2) Secondary: flat foot
: hammer toes

Compl: (1) **Bunion**
(2) **Osteoarthritis**
(3) Flat foot
(4) Metatarsalgia
(5) Hammer toes

Treat: (1) Conservative:
(A) Broad shoes with:
(*a*) Inner wedge
(*b*) Peg between first and second toes:
: (Toe post)
(B) Strapping: leukoplast
(2) Operative:
Ind: **Age more than 10 years**
Contraind: (*a*) Pronounced spur formation
(*b*) Considerable osteoarthritis
(A) **Operations on Bones:**
(1) **Slicing operation:**
: Excision of exostosis with one-third of inner part of the metatarsal head
(2) **Oblique or wedge osteotomies of the metatarsal neck**

Tech: (*a*) Incision: flap with convexity on the dorsum
: on the inner side of the joint
↓ (*b*) Dissection of the flap: including capsule
: on inner and anterior side

↓ (c) Division of soft tissues on outer side
↓ (d) Osteotomy of the metatarsal neck
↓ (e) Closure

(3) **Excision of:**
(a) Metatarsal head
or (b) **Base of the first phalanx**

(4) **Trethowan:**

Tech: (a) Split off the exostosis with portion of metatarsal head
↓ (b) Division of metatarsal base
↓ (c) Adduction of distal portion
↓ (d) Impaction of exostosis-wedge
↓ (e) Manipulation of big toe into varus

Post-treat: (1) Fixation of the great toe:
By: Splint
In: Over-adduction and flexion
For: 5 weeks
↓ (2) Massage, movements and physiotherapy:
: from 3rd week
↓ (3) Walking: from 6th week
↓ (4) Shoes, night splints: for 24 weeks

(B) **Operations on soft tissues;**

(1) **Capsuloplasty:**
(a) Reefing the internal ligament
(b) Division of external ligament

(2) **Tendon transplantations:**
(a) Small adductor:
: From phalanx to metatarsus
+ (b) Abductor hallucis:
: To medial side of proximal phalanx

After-treat: Fixation:
By: Bandage
In: Adduction and flexion
For: 8 weeks
With: (a) Active movements: 1 week after operation
(b) Physiotherapy : 2 weeks ,, ,,
(c) Shoes and work : 6 weeks ,, ,,
(d) Full recovery : 24 weeks ,, ,,

(2) HALLUX RIGIDUS AND FLEXUS:

Def: Pain, stiffness, swelling and flexion of the big toe
due to: (a) Acute or chronic arthritis
or (b) Tenosynovitis of ext. hall. long.

Etio: (1) **Trauma**
(2) Septic
(3) Rheumatoid

(4) **Gouty**
(5) **Osteoarthritis**
(6) Osteochondritis dissecans
(7) Extra-metatarsal epiphysis
(8) **Bad shoes**
(9) Secondary to flat foot

Path: (A) **Arthritis** of first metatarso-phalangeal joint:
(a) **Acute** traumatic
(b) **Chronic** osteoarthritic
(B) **Tenosynovitis** of extensor hallucis longus

Clinic: (1) Hallux rigidus: pain + tenderness + spasm
(2) Hallux flexus: flexion
(3) Wearing out of the boot: outer sole and border

Clinical types: (1) Acute
(2) Chronic

Treat: (A) **Acute hallux rigidus and flexus:**
(1) Rest in bed
↓ (2) Immobilisation in splint or plaster
↓ (3) Elastoplast strapping
↓ (4) Radiant heat
↓ (5) Foot-wear
With . metatarsal bar
: inner border wedge
(B) **Chronic hallux rigidus and flexus:**
(1) Conservative:
: Foot-wear with metatarsal bar
(2) Operative:
Ind: Resistant cases only
Oper. (1) Cheilo-tomy
(2) Excision metatarsal head

(3) HAMMER TOE:

Def: (1) Hyperextension of first phalanx
(2) Hyperflexion of second phalanx
(3) Extension or flexion of third phalanx

Etio: (1) Congenital
(2) Secondary: to
(a) Hallux valgus
(b) Pes cavus
(c) Bad boots

Path: Duchenne's theory: (See under Pes Cavus)

Clinic: (1) Claw toes: *(See definition)*
(2) Associated or etiological foot deformities:
(a) Pes cavus
(b) Hallux valgus

Compl : (*a*) Callosities
(*b*) Adventitious bursæ
(*c*) Corns
(*d*) Ulcers

Treat : (1) **Preventive :** Splinting, special boots
Manipulations
Physiotherapy
Etiological treatment

(2) ***Operative :***
(A) Congenital :
: Subcutaneous division of a phalanx
Ind : Age 3 years
(B) Acquired :
(*a*) **Soft tissue operations :**
(1) *Subcutaneous* ***tenotomy of*** **flexor** and capsule
: At the site of flexion (ventral)
(2) Subcutaneous **tenotomy of extensors** and capsule
: At the site of extension (dorsal)
(3) **Robert Jones : Tendon transplantation**
(*a*) Ext. hall. brevis to first metatarsal neck
\+ (*b*) Ext. hall. longus to dorsum first phalaux
(4) **Trethowan : Tendon transplantation+tenotomy**
(*a*) Flex. hall. long. into proximal phalanx
\+ (*b*) Tenotomy of long & short extensor tendons
(*b*) **Bone operations :**
(1) **Excision :**
: Of first or of all metatarsal heads
(2) **Excision+arthrodesis :**
: Of first interphalangeal joint
(3) **Higgs' spike** operation :
: With arthrodesis head of the first phalanx to fit into base of the second phalanx
(*c*) **Mixed operations :**
: **Lambrinudi :**
: **Tenotomy+arthrodesis**
(1) Tenotomy of long and short extensor tendons

+ (2) Excision and arthrodesis of interphalangeal joints

(3) **Palliative**: Shoes and arch supports

(II) SPECIAL AFFECTIONS OF THE FOOT:

(I) TRAUMA OF THE FOOT:

(1) **Open wounds**:

Etio: (a) Incised: glass pieces
(b) Punctured: glass, nails, thorns
(c) Lacerated: run-overs

Compl: (1) **Sepsis**: Suppuration
Cellulitis
Lymphangitis
Lymphandenitis
(2) **Anærobic infection**: Tetanus
Gas gangrene
(3) **Gangrene**: Senile
Diabetic
(4) Retention of **foreign bodies**
(5) Hæmorrhage

Treat: (1) Tourniquet
(2) Thorough exploration
(3) Complete debridement with oxidation
(4) Hypertonic pack
+ (5) Prophylactic: anti-tetanus serum
anti-gas-gangrene serum
Ind: (a) Punctured wounds
(b) Soiled wounds
(c) Street wounds

(2) **Crushed injuries**:

Etio: Run-overs

Path: Laceration of soft tissues + comminuted fractures

Treat: (1) Debridement: excision of dead tissues
: repair of living & viable tissues
(2) Amputation: only if necessitated

(3) **Impact injuries**:

Etio: Falls from height

Path: (1) **Local fractures** & dislocations with impaction:
: Bilateral or unilateral
(a) Fracture **os calcis**
(b) Fracture-dislocations of **ankle** joint
(2) Associated **distant fractures**:
(a) Tibia + fibula
(b) Femur
(c) Spine

(4) **Twisting injuries**:

Etio: Falls with tripping
Path: (*a*) Sprains
(*b*) Fractures
(*c*) Dislocations
} near about ankle joint

(5) **Osteochondritis juvenilis:** (See page 288)
: Sever; Kohler; Freiburg.

The tissues affected:

(1) Skin: punctured and lacerated wounds
(2) Ligaments and fasciæ: tearing
(3) Tendons: ruptures and divisions
(4) Bones: fractures:
(*a*) Pott
(*b*) Wagstaffe
(*c*) Dupuytren
(*d*) Calcaneus
(*e*) Talus
(*f*) Navicular
(*g*) Metatarsals
(*h*) *Phalanges*
(5) Joints:
(*a*) Sprains
(*b*) Dislocations
(*c*) Open wounds

Special compl: (*a*) **Tetanus**
(*b*) **Gas-gangrene**
(*c*) Lymphangitis → lymphadenitis
(α) Popliteal
(β) Femoral
(γ) Inguinal
(δ) Iliac

(II) INFECTIONS OF THE FOOT:

(A) **Pyogenic sepsis:**

(1) **Acute pyogenic sepsis:**
Etio: (*a*) Septic wounds: punctured
(*b*) Septic warts, corns, bursæ
Path: (*a*) Local abscess
(*b*) Cellulitis
(*c*) Lymphangitis
Compl: (*a*) Lymphadenitis
(α) *Femoral*
(β) Iliac
(*b*) General sepsis
(*c*) Local extension: bone

(2) **Chronic pyogenic sepsis**
Etio: (*a*) Pyogenic infection
+ (*b*) Accessory factors:
(1) Anatomical: bone, joint
(2) Physiological: bad circulation

(3) Mechanical: want of rest
(4) Metabolic: diabetes
(5) Foreign body:
: Sequestrum, needle, thorn
(6) Therapeutic: deficient drainage

Clinic: Non-healing chronic septic focus
Compl: Inguinal lymphadenitis

(B) **Specific infections:**

(1) **Tuberculosis:**
(A) T. B. Ankle
(B) T. B. Tarsus

(2) ***Mycetoma:***

Def: A tropical fungous disease affecting the foot and characterised by:
(*a*) Enlargement
(*b*) Multiple sinuses
(*c*) Oily discharge

Etio: Village population of South India

Path: Infection by white or black fungus mycetoma
↓ (*a*) Oily degeneration and fusion of tissues
(*b*) Net-work of sinuses and cystic spaces
(*c*) Bones:
(α) Affected: in some cases
(β) Free: in other cases

Clinic: (1) **Nodules:** Small, firm, rounded, painless
↓ (2) **Sinuses:** (*a*) Viscid, oily discharge
(*b*) Minute greyish particles
↓ (3) **Elephant-foot:**
: Solid, coarse, nodular swelling with multiple discharging sinuses
\+ (4) **Atrophied leg muscles**

Treat: (A) Pot. iodide in large doses
(B) **Amputation**

(3) **Guinea-worm:** (See page 25)
(*a*) Abscess
(*b*) Ulcer
(*c*) Cellulitis
(*d*) Synovitis: Ankle

(4) **Filariasis:** (See under Filariasis)
(5) **Leprosy:** (See under Leprosy)

(III) ULCERS OF THE FOOT:

(1) **Chronic traumatic or septic ulcer:**

Etio: Factors:
(*a*) Anatomical: nature of tissues
(*b*) Physiological: defective circulation
(*c*) Mechanical: want of rest

(*d*) Metabolic : diabetes
(*e*) Foreign body : sequestrum, needle
(*f*) Therapeutic : bad drainage

Treat : (1) Treat the etiological factor
(2) Open treatment : rest + elevation
correct dressings
ultra-violet rays
(3) Closed treatment :
. Plaster fixation after emollient dressings

(2) **Neurogenic ulcer :** (See page 34)
(*a*) Perforating ulcer : deep or through-and-through
(*b*) Trophic ulcer : superficial

(3) **Circulatory ulcer :**
: Raw area after separation of circulatory gangrene

(4) **Diabetic ulcer :** (See page 35)

(5) **Specific ulcers :**
(A) Tuberculous } Round about the ankle
(B) Syphilitic }
(C) Leprosy : toes and fore-foot

(6) **Matabolic : Gouty ulcer :**
: First metatarso-phalangeal joint

(7) **Pressure sores :** (See page 31)
(A) Splint sores . back of the heel, over Achilles tendon
(B) Plaster sore : " " " "
(C) Bed-sore : " " " "
(D) Irritation sore : convexity of deformed foot
(E) Ulcerating corn
(F) Ulcerating adventitious bursa

(8) **Moisture ulcers :**

Etio : Moisture and sepsis between toes

Clinic : (1) Irritation dermatitis with foul smell
(2) Perspiring feet

Treat : (1) Keep dry : spirit with zinc-boric
(2) Foot-wear : perforated and spacious

(9) **Ingrowing toe-nail :**

Etio : Ill-fitting boots + too short nail

Site : Outer side of hallux

Path : Septic irritation
↓ Inflammation
↓ **Chronic ulceration**

Clinic : Nail embedded in granulations from the overhanging margin with foul discharge

Treat : (1) Preventive : square nails
square spacious boots
cleanliness and dryness

(2) Operative:
- (*a*) **Avulsion** of the nail
- (*b*) **Willet**: Excision of skin flap ·5″ wide
- (*c*) **Cheyne**: Excision of { skin flap / half of nail / half of nail matrix }
- (*d*) **Amputation** of last phalanx

(IV) SINUSES OF THE FOOT:
- (1) **Osteomyelitic sinus**: Leads to necrosed bone
- (2) **T. B. sinus**: Ankle or tarsus
- (3) **Mycetoma** foot
- (4) Actinomycosis
- (5) **Perforating** sinus

(V) GANGRENE OF THE FOOT: (See under Gangrene)
- (A) **Circulatory gangrene**:
  - (1) Impaired circulation
  - (2) Embolism
  - (3) Thrombosis: thrombosed aneurysm
  - (4) Ligation: Hunter's operation for popliteal aneur.
  - (5) **Indirect traumatic**
  - (6) Pressure: on vessels
  - (7) **Senile: arteriosclerotic**
  - (8) **Thrombo-angiitis obliterans**
  - (9) Raynaud
- (B) **Neurogenic gangrene: Trophic ulcers**
  - (*a*) **Bed-sores**
  - (*b*) **Splint sores**
  - (*c*) **Perforating ulcers**
  - (*d*) **Leprosy**
- (C) **Direct traumatic gangrene**
- (D) Physical, chemical and thermal gangrene:
  - (1) Heat: burns
  - (2) Cold: frost-bite
  - (3) Escharotics
- (E) **Infective gangrene**:
  - (1) Acute inflammatory
  - (2) **Gas gangrene**
- (F) **Diabetic gangrene**

(VI) SPECIAL NEW GROWTHS OF THE FOOT:
- (1) **Warts and corns**: (See page 39)

Etio: (*a*) Ill-fitting boots
(*b*) Points of pressure

Clinic: Pain, tenderness, induration, limping

Compl: (*a*) Inflammation → cellulitis
↓ (*b*) Suppuration

↓ (c) Ulceration
↓ (d) **Gangrene: in diabetics**

(2) **Epithelioma:** (See page 41)

Etio. (a) Chronic ulcers and sinuses
(b) Tar and paraffin

(3) **Melanoma malignum:** (See page 43)

Syn: **Melanotic whitlow**

Site: Edge of the matrix of the **hallux** nail

Clinic: (a) Paronychial **ulcer** with or without pigment
(b) **Thrombosed veins** and black streaks on leg
(c) Enlarged femoral **lymph glands**
(d) **Secondaries**

(4) **Sub-ungual exostosis:**

Path: (a) Fibroma
or (b) Cancellous **osteoma**

Site: **Under the hallux nail**

Clinic: (1) Painful separation of the nail
(2) Underlying hard tumour
(3) Limping

Compl: (1) Infection
(2) Chronic ulceration
(3) Osteomyelitis

Treat: **Excision** of nail and the growth

(VII) DEFORMITIES OF THE FOOT: (See above)

(III) SPECIAL AFFECTIONS OF THE LEG:

(I) TRAUMA:

(1) **Skin and subcutaneous tissues:**

(A) **Contusions:**

Site: Over the shin

Etio: Falls, hits

Compl: (1) Periostitis
(2) Non or delayed healing

(B) **Lacerations:**
(1) Primary
(2) Secondary: to open fractures

(2) **Muscles and tendons:**

(A) Ruptures:
(a) Tennis leg: (See page 63)
(b) Gastrocnemius: (See page 63)
(c) Tendo Achilles: („ „ 64)

(B) Luxations:
(a) Peronei
(b) Tibialis ant. and post.
} (See page 65)

(3) **Nerves:** Common peroneal: (See page 123)

Etio: Fracture neck of fibula
Excision fibular head

(4) **Bones:**

(A) Periosteal contusions:
: Secondary to skin contusions

(B) Fractures: (See under Fractures)

(*a*) Tibia
(*b*) Fibula
(*c*) Tibia ∔ fibula

(II) INFLAMMATIONS IN THE LEG:

(A) ACUTE INFLAMMATIONS:

(1) **Boils:**

Site: **Shin**

Clinic: Very painful
Toxæmia +

Compl: **Bone infection**

(2) **Lymphangitis:**

Etio: Primary focus in the foot

Clinic: (*a*) **Septic focus** in the foot
(*b*) **Tender femoral glands**

Compl: Lymphadenitis:
(*a*) Femoral
(*b*) External iliac

(3) **Cellulitis:**

Etio: (*a*) Ascending lymphangitis
(*b*) Acute osteomyelitis
(*c*) **Guinea-worm**

(4) **Abscess:**

Etio: (*a*) Suppurating gumma
(*b*) Intra-muscular abscess
(*c*) Osteomyelitic abscess
(*d*) Guinea-worm abscess

(5) **Acute periosteomyelitis:** (See under Bones)

Etio: Some small suppurative focus

Clinic: (1) **Toxæmia + +**
↓ (2) Painful, tender, œdematous, **diffuse inflammatory swelling** of the leg
+(3) Knee effusion
↓ (4) Presenting abscess leg
↓ (5) Rupture with amelioration of general symptoms

Compl : (*a*) **Chronic periosteomyelitis**
(*b*) Fibrotic contractures of the calf muscles
(*c*) Knee-joint sepsis

(6) ***Acute traumatic sepsis :***

Etio : Infected open fractures

(B) CHRONIC INFLAMMATIONS :

(1) **Chronic traumatic :**
(*a*) Foreign bodies
(*b*) Chronic sprain : knee or ankle
(*c*) Osteochondritis : tibial tubercle
(*d*) Chronic bursitis : around knee

(2) **Chronic septic :**
(*a*) Non-healing of acute inflammations
(*b*) Chronic periosteomyelitis : tibia
(*c*) Baker's cysts : near about the knee

(C) SPECIFIC INFLAMMATIONS :

(1) **Tuberculosis :** Bazin's disease : (See page 22)

(2) **Syphilis :**

(*a*) **Skin :** Gummatous ulcer or scar
Site : Round about knee or lower leg
Clinic : (*a*) Ulcer : (See page 23)
(*b*) Scar :
: *Round, thin, papery, multiple*

(*b*) **Muscles :** Gumma
Site : Calf muscles
Clinic : (*a*) Hard mobile tumour → abscess
(*b*) Therapeutic test
Diff. diag : (*1*) *Sarcoma* (*a*) *Muscular*
(*b*) Bony
(2) Any other tumour or abscess

(*c*) **Bones :** Syphilitic sclerosis

(3) **Elephantiasis :** (See under Filariasis)

(III) ULCERS OF THE LEG :

(A) NON-INFECTIVE :

(1) **Circulatory ulcers :**
(*a*) **Varicose ulcer :** (See page 33)
(*b*) ***Ischæmic ulcer :*** *Post-gangrenous ulcer*
: Non-healing ulcer with circulatory inadequacy

(2) **Mechanical ulcers :** (See page 35)
: Non-healing due to mechanical factors

(3) ***Neurogenic ulcers :***
: **Trophic ulcer :** Underlying nerve paralysis
(α) Peripheral
(β) Spinal

(B) INFECTIVE:

(1) **Osteomyelitic ulcer:**

: Sinus or extensive ulcer

: Adherent to and leading to the bone

(2) **Eczematous ulcer:** (See page 34)

: Secondary to varicose veins

(C) SPECIFIC:

(1) **Syphilitic ulcer:** (See page 23)

Sites: (*a*) Round about the knee

(*b*) Lower part of the leg

(2) **Tuberculosis:** Bazin's disease: (See page 22)

(D) ULCERATING TUMOURS:

(1) **Epithelioma:** (See page 41)

Etio: (*a*) Burns scar

(*b*) Varicose ulcer

(*c*) Osteomyelitic sinus

(2) **Fungating sarcoma:**

(*a*) Bone

(*b*) Muscle

(IV) GANGRENE OF THE LEG: (See Gangrene Foot)

pecial gangrenes: (1) Direct traumatic gangrene

(2) Anærobic: gas-gangrene

(3) Ascending gangrene from foot

(4) Embolic gangrene

(V) NEW GROWTHS OF THE LEG:

(1) **Skin and subcutaneous tissues:**

(A) **Epithelioma:** (See above and page 41)

(B) **Popliteal lipoma:**

Clinic: Lobulated, irregular, soft, popliteal swelling

(C) **Neuro-fibroma:** (See page 101)

(2) **Muscles and tendons:**

(A) **Ganglion:** (See page 76)

(B) **Sarcoma:**

Site: Calf muscles

Clinic: Diffuse, hard or soft tumour incorporated with the muscle fibres; **movable on the bone**

Diff. diag: (1) Gumma

(2) Bone sarcoma or giant-celled tumour

(3) **Bones:** (See under Bones)

(A) **Chondroma:** (See under bones)

Site: Upper end of tibia

(B) **Osteoma:** Ossifying chondroma

Compl : (*a*) **Chronic periosteomyelitis**
(*b*) Fibrotic contractures of the calf muscles
(*c*) Knee-joint sepsis

(6) **Acute traumatic sepsis :**
Etio : Infected open fractures

(B) CHRONIC INFLAMMATIONS :

(1) **Chronic traumatic :**
(*a*) Foreign bodies
(*b*) Chronic sprain : knee or ankle
(*c*) Osteochondritis : tibial tubercle
(*d*) Chronic bursitis : around knee

(2) **Chronic septic :**
(*a*) Non-healing of acute inflammations
(*b*) Chronic periosteomyelitis : tibia
(*c*) Baker's cysts : near about the knee

(C) SPECIFIC INFLAMMATIONS :

(1) **Tuberculosis :** Bazin's disease : (See page 2

(2) **Syphilis :**
(*a*) **Skin :** Gummatous ulcer or scar
Site : Round about knee or lower leg
Clinic : (*a*) Ulcer : (See page 23)
(*b*) Scar :
: Round, thin, papery, multi
(*b*) **Muscles :** Gumma
Site : Calf muscles
Clinic : (*a*) Hard mobile tumour → absc
(*b*) Therapeutic test
Diff. diag : (1) Sarcoma (*a*) Muscular
(*b*) Bony
(2) Any other tumour or absces
(*c*) **Bones :** Syphilitic sclerosis

(3) **Elephantiasis :** (See under Filariasis)

(III) ULCERS OF THE LEG :

(A) NON-INFECTIVE :

(1) **Circulatory ulcers :**
(*a*) **Varicose ulcer :** (See page 33)
(*b*) **Ischæmic ulcer :** Post-gangrenous ulcer
: Non-healing ulcer with circulatory inadequacy

(2) **Mechanical ulcers :** (See page 35)
: Non-healing due to mechanical factors

(3) **Neurogenic ulcers :**
: **Trophic ulcer :** Underlying nerve paralysis
(α) Peripheral
(β) Spinal

(B) INFECTIVE:

(1) **Osteomyelitic ulcer:**
: Sinus or extensive ulcer
: Adherent to and leading to the bone

(2) **Eczematous ulcer:** (See page 34)
: Secondary to varicose veins

(C) SPECIFIC:

(1) **Syphilitic ulcer:** (See page 23)
Sites: (*a*) Round about the knee
(*b*) Lower part of the leg

(2) **Tuberculosis:** Bazin's disease: (See page 22)

(D) ULCERATING TUMOURS:

(1) **Epithelioma:** (See page 41)
Etio: (*a*) Burns scar
(*b*) Varicose ulcer
(*c*) Osteomyelitic sinus

(2) **Fungating sarcoma:**
(*a*) Bone
(*b*) Muscle

(IV) GANGRENE OF THE LEG: (See Gangrene Foot)

ɔecial gangrenes: (1) Direct traumatic gangrene
(2) Anærobic: gas-gangrene
(3) Ascending gangrene from foot
(4) Embolic gangrene

(V) NEW GROWTHS OF THE LEG:

(1) **Skin and subcutaneous tissues:**

(A) **Epithelioma:** (See above and page 41)

(B) **Popliteal lipoma:**
Clinic: Lobulated, irregular, soft, popliteal swelling

(C) **Neuro-fibroma:** (See page 101)

(2) **Muscles and tendons:**

(A) **Ganglion:** (See page 76)

(B) **Sarcoma:**
Site: Calf muscles
Clinic: Diffuse, hard or soft tumour incorporated with the muscle fibres; **movable on the bone**
Diff. diag: (1) Gumma
(2) Bone sarcoma or giant-celled tumour

(3) **Bones:** (See under Bones)

(A) **Chondroma:** (See under bones)
Site: Upper end of tibia

(B) **Osteoma:** Ossifying chondroma

Compl : (a) **Chronic periosteomyelitis**
(b) Fibrotic contractures of the calf muscles
(c) Knee-joint sepsis

(6) **Acute traumatic sepsis :**

Etio. Infected open fractures

(B) CHRONIC INFLAMMATIONS:

(1) **Chronic traumatic :**
(a) Foreign bodies
(b) Chronic sprain : knee or ankle
(c) Osteochondritis : tibial tubercle
(d) Chronic bursitis : around knee

(2) **Chronic septic :**
(a) Non-healing of acute inflammations
(b) Chronic periosteomyelitis : tibia
(c) Baker's cysts : near about the knee

(C) SPECIFIC INFLAMMATIONS:

(1) **Tuberculosis :** Bazin's disease : (See page 22)

(2) **Syphilis :**
(a) **Skin :** Gummatous ulcer or scar
Site : Round about knee or lower leg
Clinic : (a) Ulcer : (See page 23)
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: Round, thin, papery, multiple
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Site : Calf muscles
Clinic. (a) Hard mobile tumour → abscess
(b) Therapeutic test
Diff. diag : (1) Sarcoma (a) Muscular
(b) Bony
(2) Any other tumour or abscess
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(*b*) Lower part of the leg

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Site: Calf muscles

Clinic: Diffuse, hard or soft tumour incorporated with the muscle fibres; **movable on the bone**

Diff. diag: (1) Gumma

(2) Bone sarcoma or giant-celled tumour

(3) **Bones:** (See under Bones)

(A) **Chondroma:** (See under bones)

Site: Upper end of tibia

(B) **Osteoma:** Ossifying chondroma

(C) **Giant-celled tumour:**

Site: (*a*) Upper end of tibia
(*b*) Upper end of fibula

(D) **Sarcoma:**

Path: (*a*) Parosteal
(*b*) Periosteal
(*c*) Endosteal
(*d*) Ewing

Site: Tibia

Diff. diag: (1) **Periosteomyelitis**
(2) **New growths of bone:**
(*a*) Chondroma
(*b*) Osteoma
(*c*) **Giant-celled**
(3) **Sarcoma or gumma of the muscle**

(VI) DEFORMITIES OF THE LEG: (See above)

(VII) SPECIAL CONDITIONS OF THE LEG:

(1) **Popliteal aneurysm:** (See under Blood-vessels)
(2) **Varicose veins** : („ „ „)

(III) SPECIAL AFFECTIONS OF THE THIGH:

(I) TRAUMA:

(1) **Skin and subcutaneous tissues:**

(*a*) Stab wounds } Arterio-venous aneurysm
(*b*) Gunshot wounds }
(*c*) Lacerated wounds:
(α) Run-overs
(β) Secondary to fractures

(2) **Muscles and tendons:**

Ruptures: (*a*) Quadriceps extensor: (See under Knee)
(*b*) Adductors: (See under Muscles)

Sequelæ: (1) Adhesions and fibrosis
(2) Myositis ossificans

(3) **Bones:** (See under Fractures)

Fractures: (1) Femoral neck
(2) Trochanteric
(3) Shaft:
(*a*) Upper third
(*b*) Middle third
(*c*) Lower third
(4) Condylar

(II) INFLAMMATIONS IN THE THIGH:

(A) ACUTE:

(1) **Abscess**

(2) **Femoral lymphadenitis:**
Etio: Septic focus on foot
Clinic: Tender inflamed enlargement
Compl: (1) Abscess
(2) Extension to higher glands: ext. iliac

(3) **Acute osteomyelitis femur:** (See under Bones)
Etio: Children
Site: (*a*) **Lower extremity**
(*b*) Upper extremity
Clinical types: (1) Acute classical
(2) Septicæmic
(3) Pseudo-arthritic:
: Swelling of the knee or hip
(4) Abscess thigh: in later stages
Diff. diag: (1) Cellulitis
(2) Muscular abscess
(3) Arthritis
(4) General fevers

(B) CHRONIC:
(1) **Chronic abscess:**
(*a*) **Lymphatic** gland abscess
(*b*) Chronic **bursal** abscess
(*c*) **Psoas** abscess
(*d*) **Osteomyelitic** cold abscess
(2) **Chronic lymphadenitis:**
(*a*) Primary chronic
(*b*) Secondary to acute
(3) **Chronic Bursitis:** (See page 90)
(*a*) Psoas
(*b*) Trochanteric
(*c*) Gluteal
(*d*) Supra-patellar
(4) **Chronic osteomyelitis:** (See under Bones)
(*a*) Secondary to acute osteomyelitis
(*b*) Septic open fractures

(III) GANGRENE OF THE THIGH:
(1) Secondary to gangrene leg and foot
(2) Gas-gangrene

(IV) NEW GROWTHS OF THE THIGH:
(1) **Skin and subcutaneous tissues:**
: Femoral lipoma
(2) **Bone:**
(A) **Chondroma:**
Site: Lower end of the femur
↓ (B) **Osteoma:**
Site: Lower end of the femur

(C) **Giant-celled tumour:**
Site : Lower end of the femur
(D) Sarcoma

(V) DEFORMITIES IN THE THIGH. (See above)

(VI) SPECIAL CONDITIONS IN THE THIGH:

(1) **Vein :** *(a)* **Saphenous varix**
(b) **Femoral vein thrombosis**
(2) Artery : femoral aneurysm
(3) Artery + vein : *arteriovenous aneurysm*
(4) Femoral hernia
(5) Ectopic testis

(IV) PAIN IN THE LOWER EXTREMITY:

(1) PAIN IN THE THIGH AND LEG·

(A) *Neuralgic pain :*

(1) **Sciatica :** (See page 121)
(a) **Primary :** Peripheral neuritis
(b) **Secondary** to :
(α) Pressure in **gluteal** region
(β) **Hip** joint disease
(γ) **Pelvic** disease :
: New growths
Inflammatory masses
Pregnant uterus
Sacroiliac disease
(δ) **Spinal** disease.
(1) Vertebræ : trauma
tuberculosis
osteoarthritis
malignancy
(2) Prolapse of nucleus pulposus
(3) Spinal column : tumour
meningitis

(2) **Femoral neuralgia or neuritis :**
: (See page 121)
(a) Primary
(b) Secondary : aneurysm
iliac growths
femoral hernia

(3) **Obturator neuralgia or neuritis :**
: (See page 121)
(a) Primary
(b) Secondary : T.B. hip
sacroiliac disease
pelvic growths
obturator hernia
carcinoma rectum

(4) **Meralgia parasthætica:** (See page 120)
Etio: (*a*) Prolonged standing
(*b*) Obesity
(*c*) Flat foot

(5) **Multiple peripheral neuritis**

(6) **Tabetic crises**

(B) *Circulatory pain:* (See under Blood-vessels)

(1) **Varicose veins:**
· Feeling of heaviness and fatigue

(2) **Intermittent claudication:**
: Fatigue, pain and cramps after working, relieved by rest
Etio: (*a*) Arterio-sclerosis with thrombosis
(*b*) Thrombo-angiitis obliterans
(*c*) Raynaud

(3) **Acute circulatory pain:** Embolic gangrene

(C) *Referred visceral pain:*

(1) **Rectum:** Carcinoma
(2) **Bladder:** Carcinoma
(3) **Prostate:** Carcinoma
(4) **Uterus:** Displacements
New growths
Pregnancy
(5) **Kidney:** Renal colic

(2) PAIN IN THE HEEL:

(1) **Skin:**
(*a*) **Shoe bites:** Back of the heel
(*b*) **Corns:** Sole of the heel
(*c*) Chronic **ulcers**

(2) **Bursæ:**

(A) **Achillo-bursitis:** (See page 92)
Etio: (*a*) Traumatic
(*b*) Gonorrhœal
Site: Between the tendon and bone
Clinic: (1) Acute or Chronic } Inflammatory swelling under the tendon
(2) Achilles spasm: painful dorsiflexion
(3) *Inability to wear shoes*
Treat: (*a*) Treat the etiology
↓ (*b*) Physiotherapy and raised heel
↓ (*c*) Plaster-of-Paris fixation
↓ (*d*) Excision of the bursa

(B) **Bunion:** Adventitious bursa
Etio: Foot deformity (Hallux valgus)

Path : (a) Pressure and irritation
↓ (b) Tissue reaction
↓ (c) Fibrous hyperplasia with fluid
↓ (d) Adventitious bursa

Clinic : Callosity over a bony prominence

Compl : Inflammation → suppuration → ulceration :
(a) Traumatic
(b) Septic

Treat : (1) Excision
(2) Treat the etiology

(3) **Ligaments :**

(A) **Trauma :**

(a) Sprain } of { (a) Achilles insertion
(b) Rupture } of { (b) Malleolar lig.
(c) Long planter lig.
(d) Ankle joint lig.

(B) **Fibrositis :**
(a) *Gonorrhœal*
(b) Rheumatic
(c) Gouty
(d) Toxic

(C) **Calcification**

(4) **Tendons :**

(A) **Short tendo Achilles :**

Etio : Spasm
Contracture

Clinic : Dorsiflexion limited (Talipes equinus)

Associated : (a) Flat foot
(b) Claw foot

Treat : (1) Stretching of gastrocnemius
↓ (2) Plaster fixation

(B) **Subluxation of peroneal tendons :**
: (See page 65)

(5) ***Periosteum : Subcalcaneal periosteal spur***

(A) **Traumatic contusion**

(B) **Periostitis of the os calcis :**

Etio : (1) Arthritis : (a) Septic
(b) Toxic
(c) Metabolic : gouty
(2) Gonorrhœal : males between 18 & 35
: bilateral
(3) Traumatic
(4) Static or mechanical

Path : (a) Localised periostitis

+ (b) Ossification of the origins of:
  (α) Plantar fascia
  (β) Flexor brevis
+ (c) Adventitious bursitis

Clinic: (a) Painful and tender heel on:
  (α) Pressure
  (β) Weight bearing
 (b) Limping
 (c) Thickened, swollen and tender inner tuberosity of os calcis
 (d) X-Ray: spur

Treat: (1) Elimination of septic focus
 (2) Local: (a) Raise the heel of the boot
  (b) Raise the inner border
  (c) Arch supports

(6) **Bones:** Calcaneus

(A) **Congenital: Calcaneal exostosis**

Path: (1) Bilateral exaggerated development of **outer upper posterior angle**
 (2) Bilateral **subcalcaneal** spur

Compl: Bursa between skin and tendo Achilles

Treat: Excision through lateral incision

(B) **Traumatic:**

(1) **Cracks and fractures:**
 : (See under Fractures)

Etio: Falls from height

Path: Bilateral
 Comminuted

Associated: Spinal fracture

Compl: (a) Flat foot
 (b) Osteoarthritis ankle

(2) **Traction-epiphysitis of os calcis:**
 : (See under osteo-chondritis juvenilis)

Syn: Sever's disease

Etio: Girls

Age: 10 years

Path: Over-action of gastrocnemius
 ↓ Epiphysitis of the posterior os calcis

Clinic: (1) Painful limping
 (2) Tender posterior heel
 (3) X-Ray:
  : Fragmentation of epiphysis

Diff. diag: (1) Calcaneal spur
 (2) Achillo-bursitis
 (3) Planter fibrositis
 (4) Calcaneal periostitis

Treat : Foot-wear with :
(*a*) Cut back
(*b*) Raised heel
(*c*) Long arch support
(3) **Avascular traumatic necrosis :**
: (See under Fractures)
(C) **Inflammatory :**
(1) Traumatic caries
(2) Septic caries
(3) Tuberculous caries
(4) Mycetoma
(7) **Joints :** Ankle
(A) **Trauma :** Sprain, synovitis, dislocation
Fracture-dislocation
(B) **Inflammation :**
(*a*) Traumatic
(*b*) Septic
(*c*) Toxic
(*d*) Specific : gonorrhœa
(*e*) Metabolic } osteoarthritis
(*f*) Mechanical }
(8) **Foreign body retention :**
: Needles, nails, thorns, etc.
(3) PAIN IN THE FORE-FOOT :
(1) **Skin :**
(*a*) Shoe bites
(*b*) Corns and callosities
(*c*) *Chronic ulcers*
(*d*) Bunions
(2) **Bursæ :** Adventitious bursæ
(3) **Ligaments :**
(*a*) Trauma : strain, sprain, rupture
(*b*) Fibrositis : gonorrhœal, rheumatic, toxic
(*c*) Calcification
(4) **Tendons :** Tenosynovitis
(5) **Bones :**
(A) **Tarsus :**
(*a*) Cracks and fractures
(*b*) **Osteochondritis of the navicular :**
: Kohler
(*c*) Avascular traumatic necrosis
(*d*) **T. B. tarsus**
(*e*) Mycetoma
(B) **Metatarsals :**
(*a*) **Cracks and fractures :**
(1) Acute traumatic

(2) Metatarsus atavicus:
: Spontaneous fracture of second metatarsal

(3) March fracture:
Etio: Soldiers on march
On feet for long hours
Path: Spontaneous fractures of second and third metatarsal necks
Clinic: (a) No direct trauma
(b) History of long hours on feet
(c) Painful, swollen, tender metatarsus
(d) X-Ray:
(α) Crack
(β) Callus
Treat: (1) Fixation:
By: Plaster-of-Paris
For: 6 weeks
(2) Sorbo-sponge insole

(b) **Osteochondritis of second metatarsus: Freiberg**
Etio: Traumatic circulatory disturbance
Site: Head
Path: Epiphysial fragmentation
Clinic: Pain, tenderness and swelling of second metatarsal head
Treat: (1) Insole boot
(2) Excision of the metatarsal head

(c) **Morton's metatarsalgia:**
: (See under Deformities of the Foot)

(6) **Deformities:**
(a) Flat foot
(b) Pes cavus
(c) Talipes

(7) **Circulatory pain:** Circulatory gangrene

(8) **Nerve pain:** Nerve lesions

(4) PAIN IN THE TOES:
(1) Circulatory pain: gangrene
(2) Nerve pain: neuralgia
(3) Inflammatory pain: whitlow
(4) Deformity pain:
(a) Hallux valgus
(b) Hallux flexus
(c) Hallux rigidus
(d) Hammer toes
(5) Miscellaneous causes:
(a) Ill-fitting boots

(b) Bunion } Great toe
(c) Ingrowing toe-nail } Great toe
(d) Sub-ungual exostosis } Great toe

(V) SPECIAL SWELLINGS IN THE LOWER EXTREMITY:

(1) SWELLINGS IN THE FEMORAL REGION:

(A) **Reducible swellings with impulse:**
- (1) Femoral hernia: reducible
- (2) Saphena varix: examine leg
- (3) Psoas abscess: examine spine

(B) **Irreducible swelling without impulse:**
- (1) Femoral hernia: irreducible
- (2) Lymph glands: examine foot
- (3) Primary tumours: lipoma
  fibroma
- (4) Ectopic testis: examine scrotum

(C) **Deep swellings:**
- (1) Femoral aneurysm } : Pulsatile
- (2) Arterio-venous aneurysm } : Pulsatile
- (3) Distended hip joint: arthritic signs
- (4) Distended iliopsoas bursa } : Flexion thigh
- (5) Psoas abscess } : Flexion thigh
- (6) Bony swelling. callus, new growth

(2) POPLITEAL SWELLINGS:

(A) **Fluid swellings:**
- (1) Ganglion: in relation to tendons
- (2) Bursa: anatomical situation
- (3) Baker's cyst: chronic knee affection
- (4) Varicose vein: varicosities leg
- (5) Acute or chronic abscess:
  : Inflammatory signs
  - (a) Suppurating lymph glands
  - (b) Osteomyelitis femur
- (6) Popliteal aneurysm: pulsating tumour

(B) **Solid swellings of soft tissues:**
: Movable on the bone
- (1) Enlarged lymph glands
- (2) Lipoma
- (3) Sarcoma

(C) **Solid bony tumours:** Immovable on the bone
- (α) Trauma:
  : Callus formation: lower end femur
- (β) Inflammations:
  - (1) Periostitis: one-sided thickening
  - (2) Brodie's abscess: all round thickening
- (γ) Tumours:
  - (1) Chondroma: femur, tibia, fibula
  - (2) Osteoma: " " "

(3) **Giant-celled tumour:**
: Femur, tibia, fibula, patella
(4) Sarcoma: endosteal and periosteal

(3) SWELLING IN THE CALF:
(1) **Skin: Elephantiasis:**
: Lymphatic, filarial, neuro-fibromatous
(2) **Muscles:**
(a) **Gumma:** Reaction to pot. iodide
(b) **Sarcoma:** Movable on the bone
(3) **Bones:**
(a) Chronic periosteomyelitis
(b) Specific bone sclerosis
(c) Tumours:
: chondroma
osteoma
giant-celled tumour
sarcoma: periosteal
endosteal
Ewing

(4) SWELLING OF THE FOOT:
(1) **Elephantiasis:** Coarse nodulated thick skin
(2) **Mycetoma:** Multiple sinuses

(5) MULTIPLE TUMOURS ON THE INFERIOR EXTREMITY
(1) Multiple lipomata
(2) Multiple neurofibromata

(VI) IMPORTANT POINTS

(A) **Congenital affections:**

(1) Congenital talipes equino-varus and flat feet are two of the commonest congenital affections of the lower extremity.

(2) Congenital deformity is distinguished from the acquired by generally being bilateral and non-associated with trophic changes; the pain and disability are less than in acquired form.

(B) **Trauma:**

(1) Arterio-venous aneurysm of the femoral vessels is one of the sequelæ of penetrating or gunshot wounds of the femoral region.

(2) Mal-union of fractures is the most potent cause of pain and disability due to chronic osteoarthritis of distal joints.

(3) Tennis leg is the most common muscular injury of the leg.

(4) Punctured wounds and twisting injuries are important forms of trauma of the foot.

(5) In any open wounds of the foot, beware of:
- (a) Tetanus
- (b) Gas-gangrene.

(6) Fracture spine with bilateral fractures of os calcis is a common combination in falls from heights.

(7) Comminuted fracture of os calcis is a potent cause of flat foot with disability and pain.

(8) Every street wound:
- (A) Give prophylactic doses of:
  - (a) Anti-tetanus serum
  - (b) Anti-gas-gangrene serum.
- (B) Look out frequently for:
  - (a) *Lock jaw: even partial*
  - (b) *Local spasms of the part*
  - (c) Crepitant feel round about the wound.

(C) Sepsis:

(1) Most common septic foci on the foot:
- (a) Punctured wounds
- (b) Infected corns
- (c) Ill-pared nails
- (d) Inflamed adventitious bursæ

(2) Cellulitis round about the ankle:
? Guinea-worm.

(3) Chronic inflammatory swellings of the foot:
- (1) Elephantiasis
- (2) Mycetoma
- (3) T. B. bone or joint

(4) Every case of sepsis on the foot:
: Examine femoral and external iliac glands & vice versa.

(5) Septic foci on the hallux:
- (a) Ingrowing toe-nail
- (b) Subungual exostosis
- (c) Infected bunion
- (d) *Whitlow*
- (e) Gout

(6) Special complications of septic focus in the foot:
- (a) Tetanus
- (b) Gas-gangrene
- (c) Gangrene
- (d) Lymphangitis

(D) Ulcers:

(1) Common ulcers on the fore-foot:
- (1) Traumatic
- (2) *Septic: whitlow*

- (3) Specific: leprosy
- (4) Circulatory: post-gangrenous
- (5) Neurogenic: perforating; trophic
- (6) Secondary:
  - (a) Ulcerating adventitious bursa or bunion
  - (b) Ingrowing toe-nail
  - (c) Gouty ulceration

(2) Commonest ulcers round about the ankle:
- (a) Varicose ulcer
- (b) Gummatous ulcer

(3) Commonest ulcers round about the knee:
- (a) Gummatous ulcers
- (b) Traumatic ulcers (in children)

(4) Varicose ulcer is the special ulcer of the leg; just as lupus and rodent ulcer are the special ulcers of the face

(5) Closed treatment (emollient dressing + plaster encasement) is very useful in chronic non-healing non-specific ulcers of the leg and foot.

(E) **Gangrene:**

(1) Most common causes of gangrene of lower extremity:
- (a) Senile
- (b) Thrombo-angiitis obliterans
- (c) Gas-gangrene
- (d) Diabetic
- (e) Traumatic

(2) Remember gangrene in every septic wound on the foot of an elderly patient. Examine urine and arteries in every case.

(3) Every diabetic is in the serious danger of diabetic gangrene starting in a negligible septic focus on the foot.

(4) Periarterial sympathectomy is useful as a first step of amputation leg for dry gangrene and should be done about a week before the amputation.

It improves the circulation of the leg for about three weeks giving:
- (a) More distal level
- (b) Better healing

(5) Every case of sepsis in the foot, especially street accidents: look out for crepitant feel round about the wound: Gas-gangrene may start with dramatic suddenness and be fulminating in character.

(F) **New Growths:**

Most common new growths of lower extremity:

(A) Round about knee joint:
- (1) Sarcoma
- (2) Giant-celled tumour
- (3) Chondro → osteoma

(B) Leg:
- (1) Sarcoma:
  - (a) Bony.
    - (α) Parosteal
    - (β) Periosteal
    - (γ) Endosteal
  - (b) Muscular
- (2) Epithelioma: from a scar or an ulcer or a sinus

(C) Foot:
- (1) Papilloma: corn and wart
- (2) Subungual exostosis
- (3) Melanoma malignum

(G) Deformities:

(1) Coxa vara:

- (a) If a child between the ages of 10 and 16 develops an intermittent limp or complains of occasional stiffness in the thigh and knee, epiphyseal coxa vara must be suspected.
- (b) Important clinical sign of coxa vara due to epiphyseal slip is limitation of internal rotation and abduction
  Normal internal rotation of femur is 30°– 40°
  Normal external rotation of femur is 50°– 60°.
- (c) Every stage in the diagnosis and treatment of slipped femoral epiphysis must be clearly controlled by radiographic examination in the lateral plane.
- (d) Too short a treatment is no treatment at all in slipped epiphysis.
- (e) [illegible] side.
- (f) Varieties: (a) Pathological: (1) Epiphyseal
  (2) Cervical
  (b) Clinical: (1) Congenital
  (2) Infantile
  (3) Adolescent
  (4) Rickety
  (5) Traumatic
  (6) Osteoarthritic
- (g) Clinic: (a) Deformity:
  : Adduction and eversion
  (b) Limitations of:
  : Abduction and inversion
- (h) Treat: (1) Conservative:
  (a) Rest in bed
  or (b) Skeletal traction

or (c) Anæsthetic manipulations
↓ Plaster fixation
(2) Operative:
(a) Subtrochanteric osteotomy
(b) Lorenz bifurcation
(c) Excision of femoral head

(2) **Genu valgum:**

(a) Genu valgum develops after the child begins to walk and denotes attitude of weakness

(b) Treat: (A) Small children:
(a) Splints
(b) Physiotherapy
(B) Older children:
(a) Repeated moulding
(b) Manual osteoclasis
(C) After 4 years.
(a) Osteoclasis
(b) Osteotomy

(c) After-treat. (1) Plaster-of-Paris for 6 weeks
↓ (2) Walking calliper for 6 months.

(d) Genu valgum is a deformity at three places:
(1) Deformity at the lower end of femur
(2) Deformity at the knee joint
(3) Deformity at the upper end of tibia.

(3) **Genu varum:**

(a) Genu varum develops from birth and denotes strength

(b) Bow leg is a deformity at three places:
(1) Deformity at knee joint
(2) Deformity of the whole tibial shaft
(3) Deformity at the lower end of the tibia.

(4) **Talipes:**

(a) Talipes equinus (contracture of tendo Achilles)
↓ Talipes valgus
\+ Genu valgum
\+ Genu recurvatum.

(b) Most common deformities of the foot are:
(1) Flat foot: pes planus
(2) Talipes equino-varus.

(c) Most common causes of talipes are:
(1) Congenital
(2) Paralytic
(3) Static

(A) **Equino-varus:**

(1) There are two forms of congenital talipes equino-varus:
(a) Navicular
(b) Internal cuneiform: metatarsus varus

(2) Treatment of talipes equino-varus :
- (*a*) Manipulations + retentive apparatus + physiotherapy
- (*b*) Forcible corrections + repeated plaster fixations
- (*c*) Operative . after the age of 4 years
  - (α) Steindler :
    : Division of muscular origins from os calcis
  - \+ (β) Trethowan : capsulotomy of internal joints
  - \+ (γ) Achilles tenotomy
- (*d*) After-treatment : plaster immobilisation

(3) Treatment for congenital talipes equino-varus should begin within first ten days of birth.

(B) Pes planus : Flat feet

(1) Important arches of the foot and sequelæ of their defects :
- (*a*) Long arch of the foot .
  - (α) Internal
  - (β) External

  } → Flat foot.
- (*b*) Transverse or metatarsal arch of the foot → Morton's metatarsalgia.

(2) The most important ligament supporting the longitudinal arch is the spring or the plantar calcaneo-navicular. The most important tendon support is tibialis posterior.

(3) Persistence of passive abduction (valgus) due to toppling in of the inner pillars of the longitudinal arch is the first sign of weak foot

(4) In flat foot, it is not the deformity which is important. It is the disability which requires treatment.

(5) Gravity and fatigue are important factors in flat foot.

(6) Forcible manipulations of feet affected by acute foot-strain are harmful.

(7) When the length of tendo Achilles is to be examined, dorsiflex the foot with knees straight.

(8) Longitudinal arch is raised more by wedging the heel alone than if the sole and heel are both wedged.

(9) Flat feet in children :
- (1) Shoes + physiotherapy + exercises
- ↓ (2) Plaster in over-correction.

(10) Flat feet in adults :
- (1) Shoes + physiotherapy + exercises
- ↓ (2) Plaster in over-correction
- ↓ (3) Sole plates.

(C) Pes cavus :

(*a*) Avoid tenotomy of tendo Achilles in pes cavus.
Steindler operation is very useful.

(*b*) **Deformities of the toes :**
- (1) Hallux valgus
- (2) Hallux flexus

(3) Hallux rigidus
(4) Hammer toes

(H) **Pain in lower extremity :**

(a) **Chief causes of painful heel : Calcaneodynia**
(1) Achilles bursitis
(2) Os calcis exostosis
(3) Traction epiphysitis of os calcis
(4) Spur periostitis
(5) Corns
(6) Shoe-bite

(b) **Chief causes of painful hallux :**
(1) Ingrowing toe nail
(2) Subungual exostosis
(3) Bunion : hallux valgus
(4) Hallux rigidus : osteoarthritis
(5) Whitlow
(6) Gout
(7) Shoe-bite

(c) **Metatarsal pain :**
(1) Morton's metatarsalgia
(2) March fractures
(3) Osteochondritis · Freiberg

(d) **Circulatory pain in leg and foot :**
(1) Dry gangrene : in the neighbouring living tissues
(2) Embolic gangrene · at the site of embolus
(3) Intermittent claudication : calf muscles

(e) **Morton's metatarsalgia :**
Cause : giving way of transverse arch in :
(a) Pes cavus
(b) Ill-fitting boots
Clinic : relief on taking away boots

(f) **Sciatica :**
(α) Knee jerk is never affected in true sciatica, which is always unilateral
(β) Bilateral sciatica : ? Spinal or pelvic lesion
(γ) In every case of sciatica :
(1) Examine the spine
(2) Make rectal or vaginal examination
(3) Enquire into rectal & urinary sphincter action
(4) Exclude malignancy
(δ) Sciatica in elderly patients : exclude malignancy first

(g) A careful examination of the abdominal and pelvic viscera is necessary in all cases of pain referred to legs without obvious local cause.

(I) **Operations :**

(a) No operation on a joint should be carried out within six weeks of suppuration in the overlying bursa

(b) Excision of the head of the first or the fifth metatarsal should be avoided as far as possible, as it may lead to flat foot. Bases of proximal phalanges may be removed instead.

(c) **Named operations :**

Names	*Indications*	*Technique*
Bankart ...	T. equino-varus ...	Silk ligamentation
Cheyne ..	Ingrowing toe-nail ...	Excision of nail & skin fold
Dunn ...	Foot stabilisation ...	Triple arthrodesis of : (a) Subastragaloid (b) Calcaneo-cuboid (c) Astragalo-cuneiform
Elmslie ...	T. equino-varus ...	Osteotomy of : (a) Os calcis (b) Talus neck
Gant ..	Trochanteric deformity	Subtrochanteric osteotomy
Higgs ...	Hammer toe ...	Spike arthrodesis
Lambrinudi ...	Hammer toe ...	Tenotomy + arthrodesis
Lorenz ..	*Trochanteric deformity* Hip deformity	*Bifurcation osteotomy* below trochanter minor
Robert Jones ...	Hammer toe ...	Tendon transplantation
Steindler ...	T. equino-varus Pes cavus	Division of all soft tissue origins from under and inner surfaces of os calcis
Trethowan .	T. equino varus ... T. equinus ... Hallux valgus ... Hammer toe ...	Capsulotomy of int. joints Calf-muscle sliding Exostosis wedge Tentomy + tendon transplant
Whitman ...	T. calcaneus *Flail varus foot*	Astragalectomy
Willett ...	Ingrowing toe-nail ...	Skin-flap excision

(J) **Miscellaneous :**

(a) Abnormalities round about the nail :

(1) Ingrowing toe-nail
(2) Subungual exostosis
(3) Melanotic whitlow

(b) Ill-fitting boots are the most common cause of :

(1) Deformities :
(a) Hallux valgus

(b) Hallux rigidus
(c) Hallux flexus
(d) Hammer toes
(e) Morton's metatarsalgia

(2) Disabilities:
(a) Corns
(b) Callosities
(c) Bunions
(d) Bursæ: adventitious
(e) Ingrowing toe-nail
(f) Foul-smelling feet
(g) Shoe bites

(c) Do not forget the following in:

(1) Toes:
(a) Ingrowing toe-nail
(b) Subungual exostosis
(c) Melanotic whitlow
(d) Bunion

(2) Fore-foot:
(1) Morton's metatarsalgia
(2) March fracture
(3) Osteochondritis second metatarsal head
(4) Perforating ulcer

(3) Hind foot:
(1) Kohler's disease: navicular
(2) Sever's disease · os calcis
(3) Calcaneal spur
(4) Mycetoma
(5) Guinea-worm

(4) Leg:
(1) Varicose veins
(2) Varicose ulcer
(3) Muscular gumma
(4) Sarcoma: (a) Muscular
(b) Bony
(5) Schlatter's disease: tibial tubercle

(5) Knee:
(1) Gumma: ulcers or scars
(2) Bursitis
(3) Ganglion
(4) Baker's cyst
(5) Popliteal aneurysm
(6) Bone tumours: (a) Chondroma
(b) Osteoma
(c) Giant-celled
(d) Sarcoma
(7) Charcot joint
(8) Deranged knee

(6) Thigh:
- (1) Saphenous varix
- (2) Femoral aneurysm
- (3) Arterio-venous aneurysm
- (4) Femoral hernia
- (5) Psoas abscess
- (6) Ectopic testis
- (7) Myositis ossificans of the adductors

(7) Hip:
- (1) Congenital dislocation
- (2) Perthes' disease: osteochondritis
- (3) Slipped epiphysis: coxa vara

CHAPTER X

THE INGUINAL REGION

I. DISEASES OF THE INGUINAL REGION:

(A) THE SKIN AND SUBCUTANEOUS TISSUES:

(1) **Congenital:**

: Weakness of inguinal musculature
↓ Malgaigne's bulges

Compl: Inguinal hernia

(2) **Inflammations of the inguinal region:**

(A) **Extravasation of urine:**

Etio: Rupture urethra or bladder or ureter

Path: (1) **Superficial:** Subcutaneous
(2) **Deep:** Extraperitoneal

Clinic: (1) **Diffuse, œdematous, indurative swelling** of the inguinal region **stopping short along the Poupart**
(2) Other signs of urinary extravasation
(3) Toxæmia

Diff. diag: (1) Elephantiasis
(2) Cellulitis
(3) Lymphadenitis
(4) Funiculitis

Compl.: (1) **Urinary fistulæ**
(2) Gangrene
(3) Septicæmia

Treat: (1) Urinary drainage
(2) Multiple incisions and hypertonic packs

(B) **Elephantiasis:**

Secondary to: (*a*) [illegible]
(*b*) [illegible]
(*c*) [illegible]

(C) **Secondary to:**
(*a*) **Lymphadenitis**
(*b*) **Funiculitis**
(*c*) **Strangulated hernia**

(3) **Ulcerations of the inguinal region:**

(A) **Virulent bubo:**
: Post-lymphadenitic ulcer

(B) **Sloughing phagedænic chancre:**
: Sloughing acutely spreading ulcer

(C) **Granuloma inguinale:**

Etio: **Veneral** disease

Path: **Chronic vascular granuloma:**
: With deep formation of dense fibrous tissue

Clinic: (1) Focus on penis or pudenda
(2) **Red granulomatous mass**

Diff. diag: (1) Tertiary syphilis
(2) Malignancy

Treat: (1) Curettage and cautery
(2) Excision
(3) **Intravenous tartar emetic:**
. $\frac{1}{3}$ gr. → + $\frac{1}{3}$ gr. → $2\frac{1}{2}$ gr.
. Every alternate day

(4) **Sinuses of the inguinal region:**

(A) **Superficial**: Lymphadenitic

(B) **Deep:**

(1) **Fistulæ:**
(*a*) Artificial anus
(*b*) Fæcal fistulæ
(*c*) Urinary fistulæ

(2) **Abscesses:**
(*a*) **Iliac** abscess:
(α) Appendicular
(β) Pericæcal
(γ) Diverticulitis
(*b*) **Pelvic** abscess:
(α) Pyosalpinx
(β) Parametrial abscess
(γ) Appendicular abscess
(δ) Peritonitic abscess
(*c*) **Psoas** abscess:
(α) Spinal caries
(β) Iliac caries

(3) **Bones and joints:**
(*a*) Hip joint disease
(*b*) Iliac necrosis
(*c*) Pubic necrosis
(*d*) Femoral necrosis

(4) **Special causes:**
(*a*) Actinomycosis
(*b*) Malignancy

(5) **New growths: inguinal skin and sub-cut. tissues**

(1) Lipoma
(2) Fibroma
(3) Lymphangioma

(B) THE INGUINAL LYMPH GLANDS:

(1) **Sepsis:**

Varieties: (A) Acute sptic: **Acute bubo**
- (*a*) Primary pyogenic: septic focus
- (*b*) Secondary pyogenic: venereal focus
  - : Sepsis + (*a*) Syphilis
  - (*b*) Soft chancre
  - (*c*) Gonorrhœa

(B) Chronic septic: **Chronic bubo**
- (*a*) Secondary to acute: non-healing bubo
- (*b*) Primarily chronic

Etio: **Primary foci:**
- (1) **Foot:** Septic wounds, septic corns
- (2) **Perineum and genitals:**
  - (*a*) Pyogenic foci
  - (*b*) Venereal foci
- (3) **Gluteal:** Boils, carbuncles
- (4) **Lower abdominal wall:** Boils

(2) **Tuberculosis:** Rare

(3) **Syphilis:**
- (*a*) Secondary to primary chancre: septic
- (*b*) Secondary syphilitic: discrete, multiple

(4) **Lymphadenoma:**

Path: Late stages of Hodgkin's disease

Clinic: (*a*) All other glands enlarged
- (*b*) Spleen enlarged.
- (*c*) Fever bouts: Pel-Ebstein.
- (*d*) Anæmia
- (*e*) Biopsy

(5) **Elephantiasis:**
- (A) Lymphadenitis
- (B) Lymphatic abscess

(6) **Secondary malignant:**

Etio: (A) **Carcinoma:** Carcinomatous ulcer
- (B) **Sarcoma**
- (C) **Melanoma malignum:** Melanotic whitlow

Primary foci: (*a*) Penis: epithelioma
- (*b*) Anus: epithelioma
- (*c*) Foot: melanoma
- (*d*) Leg: sarcoma

(C) THE SPERMATIC CORD:

(1) **Congenital:**

(A) **Incompletely descended or malplaced testis:**

Clinic: (1) Small, round swelling with testicular tenderness: at
(*a*) Anterior superior spine
(*b*) Inguinal canal
(*c*) Pubic tubercle
(2) Testis absent in the scrotum.
Compl: Potential or actual hernia.
Treat: Orchiopexy + herniotomy
(B) **Inguinal hernia:** (See under Hernia)
(C) **Hydrocele;** (See under Hydrocele)
(1) Processus vaginalis:
(*a*) Congenital
(*b*) Infantile
(*c*) Encysted
(2) Canal of nuck
(3) Hernial sac

(2) **Inflammations of the cord:** Funiculitis
(A) **Torsion of the testis:** (See under Testis)
Clinic: Sudden acute epididymo-orchitis with ascending funiculitis
Diff. diag: (1) Strangulated hernia
(2) Inflamed hydrocele
Compl: Gangrene of the testis
(B) **Septic funiculitis:** (See under Spermatic cord)
Etio: (1) **Primary:** B. coli urethritis
(2) **Secondary:** To epididymo orchitis
(3) **Specific:** Tuberculous extension from
(*a*) Prostate → testis
(*b*) Testis → prostate
Path: (*a*) **Primary**
(*b*) **Descending:** testis → urethra
In: (α) Torsion testis
(β) Tuberculous testis → prostate
(*c*) **Ascending:** Urethra → testis
In: (α) Urethritic: gonorrhœal
(β) Tuberculous prostate → testis

(3) **New Growths of the cord:**
(A) Lipoma: etiology of traction hernias
(B) Fibroma
(C) Lymphangioma: diffuse hydrocele of the cord
(D) Secondary to malignant testis

(4) **Special affections of the cord:**
: (See under Spermatic cord)
(A) **Varicocele:** Varicose pampiniform veins
(B) **Thrombosis of spermatic vein**
(C) **Tuberculous infiltration of vas deferens**

(D) THE INGUINAL NERVES:

(1) **Trauma:**

Etio: **Herniotomies**
Appendicectomies

Path: (1) **Division**
(2) Contusion
(3) **Inclusion** in a suture leading to:
(*a*) Paralysis
(*b*) Neuralgia

Clinic: (A) Post-appendicectomy inguinal hernia
or (B) Ilio-inguinal neuralgia

(2) **New growth:** Neuro-fibroma

(E) OTHER INGUINAL AFFECTIONS:

(1) Aneurysm of the: (*a*) External iliac
(*b*) Femoral
(2) Psoas bursitis
(3) Femoral hernia
(4) Hip joint disease

(II) SWELLINGS OF THE INGUINAL REGION:

(A) SOLID SWELLINGS:

(1) **Enlarged lymph glands:**

Etio: (*a*) **Septic**: Bubo
(*b*) Tuberculous
(*c*) **Syphilitic**
(*d*) **Malignant**
(*e*) Lymphadenomatous
(*f*) **Filarial**

(2) **Hernia:** Omentocele: granular feel

(A) **Inguinal:** (*a*) Above the Poupart
(*b*) Above and internal to pubic spine

(B) **Femoral:** (*a*) Below the Poupart
(*b*) Below and external to pubic spine

(3) **Incompletely descended testis:** Testicular feel
Scrotal examination

(4) **Tumours:**

(A) Skin and subcutaneous tissues: lipoma
fibroma

(B) Cord: **lipoma**
fibroma
lymphangioma
malignant infiltration

(C) Bones: chondroma, osteoma, sarcoma } of { ilium, pubis, femur

(B) FLUCTUATING SWELLINGS:

(1) **Abscess:**

(*a*) **Acute:**

(1) Lymphadenitic
(2) Spermatic cord: funiculitis
(3) Iliac
(4) Pelvic
(5) Hernial sac

(*b*) **Chronic:**

(1) Lymphadenitic
(2) Psoas abscess: spinal caries
(3) Bone abscess: iliac caries
pubic caries
femoral caries
(4) Joint abscess

(2) **Vascular swellings:**

(*a*) **Saphenous varix:**

: Situation in the femoral triangle
: Impulse
: Reducible
: Varicose veins in the leg

(*b*) **Aneurysm:**

(α) External iliac
(β) Femoral

(3) **Hydrocele:**

(*a*) Processus vaginalis: (α) Congenital
(β) Infantile
(Υ) Encysted

(*b*) Canal of Nuck
(*c*) Hernial sac

(4) **Ilio-psoas bursitis:**

Clinic. (*a*) Deep fluctuating cystic swelling
(*b*) Flexion of the hip

(III) INGUINO-SCROTAL SWELLINGS:

(A) SOLID SWELLINGS:

(*a*) *Acute onset:*

(1) **Acute funiculitis:**

Clinic: (*a*) Urethritis
↓ (*b*) Painful tender firm cord
↓↑(*c*) Inflamed testis

(2) **Thrombosis of spermatic veins:**

Clinic: (*a*) History of strain or trauma
(*b*) Tortuous, firm, elongated
(*c*) **Vas distinct and unaffected**

(3) **Torsion of the testis:**
Clinic: (*a*) History of strain or trauma
(*b*) **Acute epididymo-orchitis**
+ (*c*) Acute funiculitis

(4) **Diffuse hæmatocele of the cord:**
Clinic: (*a*) History of strain or trauma
(*b*) Irreducible diffuse swelling
(*c*) Superficial ecchymosis

(5) **Strangulated hernia:**
Clinic: (*a*) History of hernia
(*b*) Inflammatory elongated swelling
(*c*) Peritoneal shock
+ or (*d*) **Intestinal obstruction**

(*b*) *Slow and gradual onset:*
(1) **Hernia:** Reducible
(2) Lipoma of the cord: irreducible, lobulated
(3) Diffuse hydrocele of the cord: lymphangioma
(4) **Malignant infiltration of the cord**
(5) **Hypertrophy of the cord:**
: Secondary to heavy testis

(B) FLUID SWELLINGS:

(1) **Hydrocele:** of
(*a*) Cord:
(α) Congenital: reducible.
(β) Infantile: irreducible
testis enveloped
(γ) Encysted: irreducible
testis separate
(*b*) Canal of Nuck
(*c*) Hernial sac: obstructed hernia
inflamed hernia
strangulated hernia

(2) **Encysted hæmatocele of the cord:**
Secondary: To trauma of the encysted hydrocele of the cord·

(3) **Acute abscess of the cord**
Clinic: (1) Acute funiculitis
↓ (2) Abscess along the cord

(4) **Internal abscess:** Travelling along the cord
(A) Iliac abscess
(B) Psoas abscess
(C) Pelvic abscess
Clinic: (1) Primary focus
(2) Two parts with communicable fluctuation
(3) Reducible
(4) Impulse

IMPORTANT POINTS

(1) The most common inflammation in the inguinal region is lymphadenitis.

(2) The most common causes of inguinal lymphadenitis are:
  (a) Sepsis from the foot
  (b) Sepsis from the genitals: venereal

(3) *Most common sequela of inguinal bubo is non-healing.*

(4) Incisions ought to be vertical in inguinal buboes.

(5) Do not forget filariasis in recurrent lymphadenitis in inguinal region.

(6) Sepsis, syphilis and secondaries are the three main causes of inguinal gland enlargement.

(7) The most common primary focus in secondary malignancy of inguinal glands: epithelioma penis.

(8) An irreducible swelling in the inguinal region:
  (a) Lipoma of the cord
  (b) Encysted hydrocele of the cord
  (c) Irreducible hernia
  (d) Mal-descended testis
  (e) Enlarged lymph glands.

(9) The most common inflammatory inguino-scrotal swellings:
  (a) Strangulated hernia
  (b) Acute torsion of the testis
  (c) Acute funiculitis.

(10) Differential diagnosis between:
  (a) Thrombosed spermatic vein
  & (b) *Vas deferens*. (α) *Normal*
    (β) Inflamed
    (γ) Beaded.

(11) Septic funiculitis:
  ? (a) Primary
  ? (b) Descending: testis → urethra
  ? (c) Ascending: urethra → testis.

(12) *Deep cystic swelling in the inguinal region:*
  ? (a) **Psoas abscess**
  (b) Psoas bursitis
  (c) Aneurysm.

(13) Sinus in the inguinal region:
  ? (a) Urinary
  ? (b) Fæcal
  ? (c) **Bones:** *Spine, ilium, pubis, femur*
  ? (d) **Joints:** Hip, sacroiliac
  ? (e) **Lymph glands**

(14) The most common affections of the inguinal region:
- (*a*) Inguinal bubo
- (*b*) Inguinal hernia.

(15) Referred pain in the inguinal area:
- ? (*a*) Renal or ureteral colic
- ? (*b*) Ilio-inguinal neuralgia.

(16) Beware of bladder, when a mass of fat is met with near the medial end of the inguinal canal.

PART III
SYSTEMIC SURGERY

THE CENTRAL NERVOUS SYSTEM

CHAPTER I

THE BRAIN AND THE MENINGES

(I) CONGENITAL ABNORMALITIES :

(1) OMPHALOSITES:

(A) **Paracephalian :**
(a) Rudimentary head formation
+ (b) Absence of other organs

(B) **Acephalian :** Complete absence of the head

(2) AUTOSITES: **Terato-encephalian**

(A) **Ex-encephalian :** Incomplete develop. of skull vault

(B) **Pseudo-encephalian :**
(a) Incompletely developed vault
+ (b) Incompletely developed brain

(C) **Anencephalian :** Complete abscence of vault and brain

(3) MICROCEPHALUS: Small skull and rudimentary brain
Clinic: Idiots

(4) HYDROCEPHALUS:

Def: Accumulation of cerebrospinal fluid within the skull cavity

Etio: (1) **Congenital :** Abnormalities
(2) **Traumatic :** Birth hæmorrhages
(3) **Inflammatory :** Meningitis :
(a) Septic
(b) Syphilitic
(c) Tuberculous
(4) **Tumour :** Pressure

Path: (A) Causes:
(1) **Excessive secretion :**
: Choroidal hypertrophy
(2) **Obstructive :**
(A) **Intra-ventricular :**
(a) Monroe
(b) Third ventricle
(c) Iter
(d) Majendie
(e) Luschka
(B) **Extra-ventricular :** Incisura te
(3) **Defective absorption :**
: Clogged arachnoidal villi

(B) Varieties:

(1) **Intra-ventricular.**

(a) Congenital abnormalities
(b) Intracerebral hæmorrhage or tumour
(c) Basal meningitis

(2) **Extra-ventricular:**

(a) Leptomeningitis with adhesions
(b) Clogged arachnoidal villi
(c) Intracranial tumours

Varieties: (A) **Infantile:**

(a) Congenital abnormalities
(b) Birth hæmorrhage
(c) Syphilitic basal meningitis

(B) **Adult:**

(a) Leptomeningitis with adhesions
(b) Tumours

Clinic: (1) Difficulty in birth
(2) Deformity:
: **Big head** with thin and separated bones
(3) Increased intracranial pressure
(4) Idiocy

Invest. (1) Ventriculo-graphy
(2) Ventricular or cistern aspiration
(3) Injection of dye into lateral ventricle
↓ Lumbar puncture:
(a) If recovered: extra-ventricular
(b) If not recovered. intra-ventricular

Treat: (1) **Tapping:**

(A) **Ventricles:**

(a) **Superior route:**
. Through the lateral angles of anterior fontanelle

(b) **Posterior route:**
: 7 cms above the ext. occ. process
: 4 cms. lateral to mid-line

(c) **Lateral route:**
: 3 cms. above and behind aud meatus

(B) **Cistern:**
: Through **atlanto-occipital** ligament

(2) **Drainage of lateral ventricles:**
: Silk, silver tube

(3) **Drainage of cisterna magna:** Into
- (a) Sub-dural space
- (b) Extra-dural space
- (c) Sub-epicranial space

(4) **Removal of choroid plexus**

(5) **Ligature of both common carotids:**
: At the interval of three weeks

(5) MENINGOCELE – ENCEPHALOCELE – HYDRENCEPHALOCELE:

Def: Congenital protrusion through a defect in the skull of:
- (a) Pouch of dura mater: meningocele
- (b) Dural pouch with brain: encephalocele
- (c) Dural pouch with ventricle: hydrencephalocele

Sites: (a) **Occipital**
- (b) Root of the nose
- (c) Anterior fontanelle
- (d) Mastoid
- (e) Basal: (α) Lamina cribrosa
  - (β) Sphenoid

Clinic. (1) Congenital, tense, rounded, pedunculated, **cystic swelling over the site**
- (a) **Communicating:** Reducible
  Impulse
  Young age
- (b) **Non-communicating:** Non-reducible
  Non-impulsive
  Adult age

(2) Signs of increased intracranial tension: on
- (a) Reduction of contents
- (b) Pressure on the swelling

(3) Translucency test

Compl. (1) Trauma and rupture
- (2) **Ulceration**
- (3) **Sepsis**
- (4) Deformity
- (5) Idiocy

Treat: (1) **Removal:**
- Ind: (a) Rapid enlargement
  - (b) Likelihood of complications
- Post. compl: (1) Hydrocephalus
  - (2) Raised intracranial tension

(2) **Protection:** Palliative

(6) INTRACRANIAL DERMOID:

Path: Contains sebum and hair

Varieties: (a) Extra-dural ⇆ extra-cranial
- (b) Sub-dural

Clinic : Signs of intracranial tumour :

- (*a*) Local : pressure on neighbouring cortex
- (*b*) General : rise in intracranial tension

Treat : Excision

(II) TRAUMA :

Etio : Injuries to the head :

- (*a*) With fracture skull
- (*b*) Without fracture skull

Pathology : *Effects of head injury on the brain are :*

(1) CONCUSSION OF THE BRAIN :

Def : **Simultaneously widespread paralysis of the brain,** which comes on as the **immediate consequence of a blow** on the head ; has a strong tendency to **spontaneous recovery** ; and is **unaccompanied by any gross organic changes** in the brain.

Theories : (1) **Trotter :**

- (*a*) Momentary hyperacute skull deformation
- ↓ (*b*) Instantaneous, momentary, cerebral anæmia
- ↓ (*c*) Instantaneous, widespread, cerebral paralysis
- ↓ (*d*) Spontaneous and sudden recovery

(2) Duret : cerebrospinal shock

(3) Gussenbauer : punctate cerebral hæmorrhages

(4) Tillmann : disturbed inter-relations of the cortex and medulla

Clinic : **Concussion syndrome**

(2) CONTUSION AND LACERATION OF THE BRAIN :

Sites : (A) **Local**

(B) **Polar :** Contre-coup

- (*a*) Against the septa
- (*b*) Against the skull

(C) **Tract :** Between local and polar sites

(D) **Ventricular walls :** Lying along the tract

Causes : (1) Closed fractures

(2) Open fractures

Path : Effects of contusion and laceration :

(1) **Direct** effects : Focal symptoms

(2) **Hæmorrhage :** Pressure effects :
: local → general

- (*a*) Extracerebral : subdural
- (*b*) Intracerebral :
  - (α) Massive
  - (β) Punctate

(3) **Œdema** of the brain :
. General increased intracranial tension

(4) **Unresolved contusion:**
: Intermittent intracranial tension symptoms

(5) **Softening** and delayed secondary hæmorrhage:
: (*a*) Latent period
↓ (*b*) Sudden tension signs

Clinic: **Irritation syndrome:**
(A) Extent: (*a*) Local or focal
(*b*) General
(B) Time: (1) Immediate
(2) Delayed
(3) Intermittent

(3) TRAUMATIC CEREBRITIS:

(A) **Local:**
Path: Around the contused or lacerated cortex
Clinic: Focal cerebral irritation

(B) **General:**
Path: Œdema of the whole brain
Clinic: General cerebral irritation

(C) **Chronic:** Unresolved contusion
Path: Vicious circle:
(*a*) Œdematous contusion
↓ (*b*) Increased intracranial tension
↓ (*c*) Venous obstruction
↓ (*d*) Œdema of the contusion = (*a*)
Clinic: Chronic and recurrent cerebral irritation

(4) INTRACRANIAL TRAUMATIC HÆMORRHAGE:

(A) **Extra-dural:**
Etio: Rare
Source: **Middle meningeal** artery:
(*a*) Anterior branch
(*b*) Main trunk
(*c*) Posterior branch
(*d*) Venæ comites
Clinic: (A) **Latent period:** 7 hours to 21 days
↓ (B) **Slowly progressive pressure signs:**
(*a*) Extent: (α) Local
↓ (β) Extending
↓ (γ) General
(*b*) Nature: (α) Irritative
↓ (β) Paralytic
Prognosis: Mortality 50%

(B) **Subdural:**
Etio: Common
Sites: (1) **Subdural:** Diffuse
(2) **Subarachnoid:** Localised

Sources : (1) Large arteries : diffuse and rapid
(2) Large veins or sinuses : diffuse and rapid
(3) Cerebral veins or capillaries : localised

Varieties : According to :

(1) **Age :**

(*a*) **Senile :**

Etio : (α) Negligible trauma to the head
+ (β) Senile shrinkage of the brain

Path : *Chronic subdural hæmatoma*

Clinic : Vague signs of increased tension

(*b*) **Adult :**

Etio : Pronounced trauma to the head

Path : Acute subdural hæmatoma

Clinic : Rapidly progressive increase in tension :
(*a*) Generalised irritation syndrome
↓ (*b*) Generalised paralysis syndrome

(*c*) ***Juvenile :***

Etio : Difficult birth

Path . Acute or chronic subdural hæmatoma

Clinic : (*a*) New-born babes
(*b*) History of difficult birth
(*c*) Convulsions → coma
(*d*) Fever
(*e*) Enlargement of head
(*f*) Fontanelle aspiration : blood

Treat : (1) **Bilateral fontanelle aspirations :**
: Alternating sides daily
(2) **Osteoplastic craniotomy**
↓ Clearing out the clot :
(*a*) One side
↓ (*b*) Other side

(2) **Rate of progress :**

(*a*) **Acute :**

Etio : Tearing of cerebral veins
Laceration of the brain

Path : Hæmatoma between dura and arachnoid

Clinic : Rapidly progressing signs of general *compression :*
(*a*) Generalised irritation syndrome
↓ passing rapidly into ↓
(*b*) *Generalised paralysis syndrome*

(*b*) **Chronic :**

Etio : Cerebral veins in seniles

Path : Tearing of veins due to brain shrinkage

Clinic : Vague chronic changing signs of *increased tension*

(3) **Site :**
  (A) **Supratentorial :** Anterior chamber synd.
    (*a*) Unilateral
    (*b*) Bilateral : contre-coup
  (B) **Subtentorial :** Posterior chamber synd.
(4) **Time :**
  (*a*) **Immediate :** Primary
    : Concussion → compression
  (*b*) **Reactionary :** Within first week
    : Concusion → latent period → compression
  (c) **Delayed :** Spät-apoplexie
(5) **Extent :**
  (*a*) **Diffuse :**
  Clinic. Rapidly progressive widespread signs of compression
  (*b*) **Spreading :**
  Clinic : Signs of extradural hæmorrhage :
    (α) Without lucid interval
    (β) With more rapid course
  (*c*) **Localised**

(C) **Intra-cerebral :**
  (1) **Primary :** Traumatic
  (2) **Delayed :** Spat-apoplexie

(D) **Intra-ventricular :**
Clinic : Rapidly progressive and pronounced signs of acute compression with **high temperature**

Pathological effects of intracranial hæmorrhage :

(1) **Compression :** The effects depend on :
  (A) **Site :** (*a*) Psychic centres
    (*b*) Motor centres
    (*c*) Vital centres
  (B) **Stage :** (*a*) Irritative
    (*b*) Paralytic
  (C) **Area :** (*a*) Local : extradural
    (*b*) Extensive : subarachnoid
    (*c*) General : subdural
  (D) **Progress :** (*a*) Gradual : extradural
    (*b*) Rapid : (*a*) Subarachnoid
      (*b*) Localised subdural
    (*c*) Immediate : acute subdural
    (*d*) Late but sudden : Spät-apoplexie
    (*e*) Chronic : chronic subdural
  (E) **Associated conditions :** Contusion and l:
(2) **Sepsis :** Intracranial sepsis

(3) **Adhesions:** (*a*) Hydrocephalus
(*b*) Epilepsy

(4) **Traumatic cysts:** (*a*) Cerebral
(*b*) Ventricular
(*c*) Meningeal

(5) LATE SEQUELÆ OF INTRACRANIAL INJURIES:

Path. factors:

(1) **Chronic mild compression:**

Causes: (*a*) Œdema of the brain
(*b*) Unresolved contusion of the brain
(*c*) Chronic subdural hæmatoma
(*d*) Blood cysts

Clinic: Chronic and intermittent signs of increased intracranial tension: chronic cerebral irritation

(2) **Adhesions:**
(A) Meningeal: hydrocephalus
(B) Cerebral: epilepsy

(3) **Traumatic blood cysts:**

Clinic: (*a*) Local irritative signs
+(*b*) General tension signs

(4) **Traumatic neurasthenia and psychosis**

Clinic: (*a*) Intermittent headaches
(*b*) Changes in temperament and personality
(*c*) Loss of memory and concentration
(*d*) Neuroses
(*e*) Insomnia → neurasthenia → insanity
(*f*) Automatic states
(*g*) Epilepsy

Treat: (1) *Full and prolonged rest*
(2) Dehydration treatment
(3) Bromides and luminal
(4) Decompression
(5) Avoidance of: sun; constipation; alcohol

The clinical stages of intracranial injuries are:

(1) CONCUSSION:

Cause: **Momentary generalised hyperacute cerebral anæmia**

Clinic: (*a*) **Instantaneous onset**
(*b*) Simultaneously uniform widespread signs
(*c*) Widespread paralysis:
: *Absence of slightest irritation*
(*d*) **Sudden and spontaneous recovery**

(2) REACTION:

Path: Slight **rebound hyperæmia** of the brain after '*concussion*' anæmia

Clinic: Very slight and temporary irritative symptoms:
- (*a*) Headache and giddiness
- (*b*) Vomiting
- (*c*) Slight rise in temperature
- (*d*) Full, slow pulse

(3) IRRITATION:

Path: (*a*) Early stage of any encroachment on intracranial space
↓ (*b*) Early stage of cerebral compression
↓ (*c*) **Cerebral venous congestion**
↓ (*d*) Irritation syndrome

Causes: (1) Trauma: hæmorrhage; œdema; fibrosis
(2) Sepsis: intracraniitis; abscess
(3) New growths: traumatic cysts

Clinic: (1) **Focal**
(2) **Regional**
(3) **General**

Stages: (1) **Progressive:** To compression
Causes: (*a*) Hæmorrhage
(*b*) New growth
(2) **Stationary:** With recurrence
Causes: (*a*) Unresolved contusion
(*b*) Chronic subdural hæmatoma
(3) **Retrogressive:** Reaction stage

(4) COMPRESSION:

Causes: (1) **Congenital:** Hydrocephalus
(2) **Traumatic:**
- (*a*) Depressed bone
- (*b*) Extravasated blood
- (*c*) Cerebral œdema

(3) **Sepsis:**
- (*a*) Meningitis
- (*b*) Encephalitis
- (*c*) Intracranial abscess

(4) **Tumours:**
- (*a*) Traumatic cysts
- (*b*) Chronic abscesses
- (*c*) Syphiloma; tuberculoma
- (*d*) New growths

Path: (*a*) Later stage of any encroachment on intracranial space
↓ (*b*) Later stage of cerebral compression
↓ (*c*) **Sustained spreading cerebral anæmia**
↓ (*d*) Paralysis syndrome

Clinical syndrome factors :

(1) **Progress :**

(A) Early and rapid : *acute subdural hæmorrhage*

(B) Late and slow :

(*a*) Extradural hæmorrhage

(*b*) New growths

(C) Late and rapid : Spät-apoplexie

(D) Intermittent and variable :

: Chronic subdural hæmorrhage

(2) **Stages :**

(A) **Focal :** Early stage :

: Local hæmatoma, abscess or tumour

↓ (B) **Regional :** (*a*) *Supratentorial :*

(α) Unilateral

(β) Bilateral

(*b*) Subtentorial

↓ (C) **General :** Very late stage

(3) **Sites :**

(A) **Cerebral :** (*a*) Consciousness

(*b*) Mental qualities

(*c*) Motor system

(*d*) Special organs

(B) **Mid brain :** *Pupils*

: Heat regulation

(C) **Hind brain :** Bulbar signs

: Vital centres : respiratory

cardiac

vasomotor

(D) **Cranial nerves :**

. Irritation → paralysis of individual nerves

(See next page for Table)

Special signs :

(1) **Retrograde amnesia of Trotter :**

: In concussion

Def : Permanent and absolute lack of memory for the *events at the time of the accident*

(2) **Vasomotor reaction of Cushing :**

: In late compression

: In post-chamber syndrome

Def : Fluctuations in B. P. with fluctuations in the brain activity, due to periodic inactivity of the vasomotor centre, caused by *anæmia brought about by the* increased intracranial pressure, *alternating with* periodic activity, caused by auto-recovery of the centre due to anæmic stimulation.

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Clinical features of the different states of intracranial trauma

	Concussion	*Reaction*	*Irritation*	*Compression*
(1) **Consciousness**	slight giddiness to profound coma	conscious but apathetic	conscious but irritable to delirious	drowsiness to semi-consciousness to profound coma
(2) **Motor**	widespread paralysis with relaxation	Nil	(*a*) attitude of flexion (*b*) rigidity (*c*) convulsions	paresis ↓ paralysis
(3) **Reflexes**	absent	slightly exaggerated	*exaggerated*	absent
(4) **Pupils**	equal dilated sluggish	equal	equal, contracted, sluggish	(*a*) unequal ↓ (*b*) both dilated & fixed
(5) **Sphincters**	*incontinence* (paralytic)		incontinence (irritative)	incontinence (paralytic)
(6) **Sensory**				
(A) Headache		slight	pronounced	
(B) Vomiting		once	repeated	
(C) Other sensory	signs *cannot be elicited or relied upon*			
(7) **Bulbar**				
(A) Respiration	slow shallow	normal	slow deep	irregular shallow, gasping, Cheyne-Stokes
(B) Cardiac (Pulse)	weak rapid	full slightly slow	bounding slow	bounding → weak slow → rapid
(C) Vasomotor (B. P.)	fall	slight rise	profound rise	rise ↓ Cushing phenomenon ↓ fall

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Path : (*a*) Increased intracranial pressure
↓ (*b*) Anæmia of vasomotor centre :
(α) Fall in B. P.
(β) Inactive brain
↓ (*c*) Anæmic stimulation of the centre :
(α) Rise in B. P.
(β) Active brain
↓ (*d*) More hæmorrhage → increased intracranial press. and so on, the phenomenon depending on the **continuous fight between :**
(α) **Intracranial pressure anæmia**
(β) **Anæmic stimulation of vasomotor centre**

(3) **Cheyne-Stokes syndrome ← Cushing reaction :**

Def : **Rhythmic alteration of periods of inactivity and activity of the brain,** due to alternating failure and recovery of the cerebral circulation, due to vasomotor reaction of Cushing.

Clinic : (*a*) Consciousness × unconsciousness
(*b*) Motor irritation × motor paralysis
(*c*) B. P. rise × B. P. fall
(*d*) Deep respirations × shallow or absent resp.

Different clinical syndrome in Intracranial hæmorrhage :

(1) **Extradural :**
(*a*) Fracture or œdematous contusion in **temporal fossa**
(*b*) **Lucid interval :** 7 hours to 21 days
(*c*) **Slow progress :**
(α) Irritation → paralysis
(β) Focal → regional → general
(*d*) Inequality in signs on both sides

(2) **Subdural :**
(A) **Acute extensive :**
(*a*) Severe fracture skull
(*b*) **No lucid interval**
(*c*) **Very rapid progress :**
: From irritation to paralysis
: From local to general
(*d*) Extensively widespread nature of signs
(*e*) Variations between consciousness and stupor
(*f*) **Pulse rate below 60**
(*g*) Dilated pupils
(*h*) Spinal puncture
(α) C. s. f. : bloody = bad prognosis
: **clear** = good prognosis if operated upon
(β) C. s. f. : pressure normal or raised

(B) **Acute small:**
- (*a*) Characters of extradural hæmorrhage:
  - (α) Without lucid interval
  - (β) More rapid course
- ↓ (*b*) **Long cerebral irritation period**
- ↓ (*c*) Sudden signs of local compression

(C) **Chronic subdural:**
- (*a*) Old age
- (*b*) **Slight injury**
- (*c*) **Long prodromal period:**
  - (α) Group one: headache + mental changes
  - (β) Group two: brain tumour syndrome
    - (1) Headache
    - + (2) Localising phenomena
  - (γ) Group three:
    - (1) Bad headache
    - + (2) Mental aberrations
- ↓ (*d*) **Perplexing alternation between signs:**
  - (α) Irritative and paralytic
  - (β) Appearance and disappearance of reflexes
  - (γ) Coma and consciousness
- ↓ (*e*) **Sudden extensive paralytic signs**
- (*f*) **Dural exploration:** Dark blue dura
  - Tech. (α) Exploratory drill holes:
    - ; Bilateral parieto-occipital
    - ; 4 cms. lateral to midline
    - ; 10 cms. above ext. occ. process
  - (β) Inspection of the dura: dark blue
  - Treat: (γ) Puncture of the capsule
    - (δ) Aspiration of the hæmatoma

(D) **Delayed hæmorrhage:** Spät-apoplexie
- (*a*) Head injury with contusion of the brain
- (*b*) **Latent period of weeks or months**
- (*c*) Sudden and unheralded signs of acute **compression after straining**

(E) **Supratentorial hæmorrhage:**
- (*a*) **Cerebral signs:** Irritative → Paralytic
  - (α) One hemisphere
  - ↓ (β) Both hemispheres
- ↓ (*b*) Bulbar symptoms

(F) **Subtentorial hæmorrhage:**
- (*a*) **Bulbar symptoms: early**
  - (α) Slow and sterterous respirations
  - (β) High blood pressure with slow pulse
  - (γ) Vomiting
  - (δ) Cheyne-Stokes phenomena
- ↓ (*b*) Death **without coma** or cerebral symptoms

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Path : (*a*) Increased intracranial pressure

↓ (*b*) Anæmia of vasomotor centre :

(α) Fall in B. P.

(β) Inactive brain

↓ (*c*) Anæmic stimulation of the centre :

(α) Rise in B. P.

(β) Active brain

↓ (*d*) More hæmorrhage → increased intracranial press. and so on, the phenomenon *depending on the* **continuous fight between :**

(α) **Intracranial pressure anæmia**

(β) **Anæmic stimulation of vasomotor centre**

(3) **Cheyne-Stokes syndrome ← Cushing reaction :**

Def : ***Rhythmic alteration of periods of inactivity*** **and** ***activity of the brain,*** *due to alternating failure* and recovery of the cerebral circulation, due to vasomotor reaction of Cushing.

Clinic : (*a*) *Consciousness × unconsciousness*

(*b*) Motor irritation × motor paralysis

(*c*) B. P. rise × B. P fall

(*d*) Deep respirations × shallow or absent resp.

Different clinical syndrome in Intracranial hæmorrhage :

(1) **Extradural :**

(*a*) Fracture or œdematous contusion in **temporal fossa**

(*b*) **Lucid interval :** 7 hours to 21 days

(*c*) **Slow progress :**

(α) Irritation → paralysis

(β) Focal → regional → general

(*d*) Inequality in signs on both sides

(2) **Subdural :**

(A) **Acute extensive :**

(*a*) Severe fracture skull

(*b*) **No lucid interval**

(*c*) **Very rapid progress :**

: From irritation to paralysis

: From local to general ·

(*d*) Extensively widespread nature of signs

(*e*) Variations between consciousness and stupor

(*f*) ***Pulse rate below 60***

(*g*) Dilated pupils

(*h*) Spinal puncture

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- (*a*) Head injury with contusion of the brain
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- (*a*) **Cerebral signs:** Irritative → Paralytic
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  - (β) High blood pressure with slow pulse
  - (γ) Vomiting
  - (δ) Cheyne-Stokes phenomena
- ↓ (*b*) Death **without coma** or cerebral symptoms

Diagnosis of intracranial hæmorrhage:

(1) **Indirect evidence:**
  (A) History of trauma: nature, severity, direction
  (B) Presence of fracture skull

(2) **Direct evidence:**
  (A) **Nature of the lesion:**
    (*a*) **External evidence:**
      (α) Safety-valve hæmatoma
      or (β) Local bogginess
      with (γ) *Absence of local signs of external violence*
    (*b*) **Lumbar puncture:**
      (α) Normal fluid:
        (1) Extradural
        (2) Subdural
        (3) Local subarachnoid
      (β) Bloody fluid: diffuse subarachnoid
      (γ) High pressure: increased tension
    (*c*) **Cerebral involvement:**
      (α) Onset: immediate or delayed
      (β) Progress: slow or rapid
      (γ) Extent: stationary or increasing
  (B) **Side of the lesion:**
    (*a*) Focal signs
    (*b*) Opposite to motor affections
    (*c*) Same as that of advanced pupil

Differential diagnosis of traumatic hæmorrhagic compression:

(1) ***Narcosis:***
  (A) Opium
  (B) Alcohol

(2) **Toxic states:**
  (A) Uræmia
  (B) Diabetic coma: acetonæmia
  (C) Sunstroke

(3) **Non-traumatic cerebral compression:**
  (A) **Circulatory:** Thrombosis, apoplexy; embolism
  (B) **Sepsis:** Meningitis; cerebritis; abscess
  (C) **Tumours:**
    : New growths; specific; cysts; aneurysms
  (D) **Hydrocephalus**

Diagnosis of hemiplegia in a comatose patient:

(A) **Face:** (α) Smoothened side
  (β) Drooping of the oral angle
  (γ) Puffing cheek

(B) ***Motor:*** (α) *Flaccidity*
  (β) Inability to participate in involuntary movements

(C) **Reflexes:**
- (α) Abolition of abdominal reflexes
- (β) Exaggeration of deep reflexes
- (γ) Babinski and ankle clonus present

(D) **Bulbar:**
- (α) Cushing's phenomena
- (β) Cheyne-Stokes phenomenon
- (γ) Non-participation by affected limb in the involuntary stereo-typed movements of Cheyne-Stokes syndrome

Birth intra-cranial injuries:

Etio: Difficult birth

Path. Cerebral:
- (*a*) Congestion
- (*b*) Contusion
- (*c*) Œdema
- (*d*) Hæmorrhage:
  - (α) Tear of longitudinal sinus
  - (β) Tear of subcortical veins

Clinic:
- (*a*) Difficulty in birth
- (*b*) Respiratory difficulties → **attacks of cyanosis**
- (*c*) Somnolence alternating with restlessness
- (*d*) Recurrent vomiting
- (*e*) Muscular twitchings → **convulsions**
- (*f*) Bulging fontanelles

Treat:
- (1) Absolute rest
- (2) Injection of 10 c.cs. of **mother's blood:**
  : Intra-muscular
- (3) **Rectal hypertonic:** Every 4 hours
  - (*a*) 3 ounces of 10% saline:
    : (1½ teaspoonful of salt in 3 ounces of water)
  - \+ (*b*) Chloral hydras: gr. ½
- (4) Subtemporal decompression

Prognosis of intracranial traumatic conditions:

Bad, if:
- (1) Progressive loss of consciousness
- (2) Restlessness
- (3) Rapid pulse
- (4) Pyrexia
- (5) Rapid and profound pupillary changes
- (6) Rapid progress in degree and extent of motor signs

Treatment; of different clinical syndrome of intra-cranial injury

(I) **Concussion: Treatment of shock + Observation**
- (1) **Rest** in bed in horizontal position:
  : For three weeks at least in a pronounced case

(2) Cold to the head and warmth to the body

(3) **Observation: Report if:**

- (a) **Temperature** rises above 100·5°
- (b) **Pulse rate**: (α) Below 60
  - (β) Above 130
- (c) Irregular or sterterous **respirations**
- (d) Unequal **pupils**
- (e) **Convulsions**
- (f) **Paralysis**
- (g) Repeated **vomits**

(II) Reaction: Rest + Purge + Observation

Ind: Headach + giddiness + vomiting + slight fever

Treat: (1) Complete rest
(2) Cold to the head
(3) Saline purge
(4) Sedatives
(5) Observation: (See above)

After-treat: (1) Convalescence: for 3 weeks
(2) Resumption of active life: after two months

(III) Irritation: (A) (Rest + Dehydration + Observation)
↓ **(B) Decompression**

Ind: (1) Increased intra-cranial pressure syndrome:
: Appearing after 48 hours
(2) Signs of irritation brain:
· Persisting for more than 48 hours

Clinic: (1) Severe persistent headache with vomits
(2) Irritability of mind and body
(3) Slow bounding pulse with fever

Treat: (1) **Rest**: Isolation in a darkened room
(2) **Sedatives**: Oral and rectal
. Aspirin, phenacetin, caffeine, bromides, chloral
(3) **Dehydration:**

(A) **Oral:**

- (a) Nacl: in keratin capsules
- (b) Purges: mag. sulph.
  croton oil
  calomel
- (c) Restriction of fluids: to two pints per day

(B) **Rectal: 50% mag. sulph.**

Mag. sulph.: ounces III
Paraldehyde: drachms IV
Aqua: ounces VI
Every 4 hours for one week

(C) **Intravenous:**
(a) 50–100 c.cs. of 15–30% Nacl
(b) 50–100 c.cs. of 50% glucose
(c) **200–300 c cs. of 50% sucrose**

(D) **Lumbar puncture:**
Ind: Diagnostic
Therapeutic
Compl: Medullary cone strangulation

(4) **Decompression:**
Ind: (a) Compression within first 48 hours
(b) Irritation → compression
(c) Prolonged irritation:
: Inspite of conservative treatment
(d) Relapse of tension signs:
: After apparent recovery
(e) Chronic, intermittent, recurring tension

Compl: (1) Lung complications: pneumonia
(2) Urinary complications: cystitis
(3) Brain complications: delirium, apathy

(IV) **Compression: Decompression**

Ind: (a) Compression signs within first 48 hours
(b) Progressive tension signs
(c) Chronic recurrent persistent tension signs

Clinical Ind. (1) **Lucid interval:**
: More its length, better the prognosis
(2) **Slow progress:**
(a) **Extent:**
: Focal → local → regional → hemispherical→anterior chamber→medullary
(b) **Degree:** Irritation → paralysis
(3) **Unequal signs on both sides:**
(a) Pupils: advanced on same side
(b) Spasms
(c) Paralysis } : lesion on opposite side
(4) High blood pressure + **slow pulse** below 60
(5) No onset of bulbar signs

Path. ind: (1) **Depressed fracture**
(2) **Extra-dural hæmorrhage**
(3) **Subdural hæmorrhage:**
(a) **Local** and not too severe
(b) **Chronic**
(4) **Unresolved contusion:**
: Chronic, intermittent tension signs
(5) **Spät-apoplexie**

Time of interference:

- (1) Persistent or progressive irritation syndrome
- (2) Appearance of paralytic signs
- (3) Appearance of unequal pupils
- (4) Before the fall of blood pressure

Cantraindications:

- (1) Extremely severe and rapidly progressive case
- (2) General deformation fractures of the skull base

  with (*a*) No compression signs
  (*b*) No prolonged irritation signs

Tech:

- (1) **Anæsthesia:**
  - (*a*) Regional: novocain
  - (*b*) General: ether (Med. Ann. 1940)

    Advantage: obliteration of cranial cavity due to post-anæsthetic œdema of the brain
- (2) **Trephining:**
  - (A) Places:
    - (*a*) Over the suspected region:
      - (α) Clinical signs
      - (β) External injuries
      - (γ) History
    - (*b*) Over the contre-coup region
    - (*c*) Classical:
      - (α) Temporal
      - (β) Occipital
  - (B) Objects:
    - (*a*) Exploration and evacuation of:
      - (α) Hæmatoma
      - (β) Foreign body
    - (*b*) Control of further bleeding
    - (*c*) Relief of tension: due to
      - (α) Depressed fracture
      - (β) Hæmatoma
      - (γ) Œdema of the brain
- (3) **Control of bleeding:** (See under Operations)
- (4) **Dural incision:**

  Ind: (*a*) Dural tension
  (*b*) Dural discolouration
  (*c*) Absent cerebral pulsation

  Contraind: (*a*) Extra-dural sepsis
  (*b*) No compression signs
- (5) **Treatment of dura:**
  - (*a*) Unperforated + no compression:
    : Do not open

(*b*) Unperforated + outside sepsis:
: Do not open
(*c*) Unperforated + compression: open
(*d*) Compression + subdural sepsis: open
(*e*) Perforated + no compression: suture
(*f*) Perforated + sepsis: do not suture
(*g*) Subdural compression + Extra-dural sepsis }: balance

(6) **Treatment of hæmatoma:**

(A) Evacuation of hæmatoma: by
(*a*) Irrigation
(*b*) Suction
(*c*) Aspiration
(*d*) Scoop

(B) Control of the source:

(*a*) **Extra-dural hæmorrhage:**

Source: Middle meningeal:
(α) Anterior branch
(β) Main trunk
(γ) Posterior branch
(δ) Venæ comites

Tech: (1) Incisions: (1) Horse-shoe
(2) Vertical
(2) Temporal split: vertical
(3) Trephine:
(α) Anterior branch:
: 2" behind ext. ang. pro.
: 2" above the zygoma
(β) Posterior branch:
: ·5" above and behind the Darwin's tubercle, with pinna lying flat against the skull

(*b*) **Subdural hæmorrhage:**

Tech: (1) Anæsthesia: local
(2) Trephine: **Two burr holes:**
(*a*) 5" above ext. occ. process
\+ (*b*) 1.5" lateral to midline
\+ (*c*) On either side
(3) Inspection of dura:
(*a*) Bulging
\+ (*b*) Plum-coloured
(4) Treatment of hæmatoma:
(*a*) Incision of the dura
\+ (*b*) Suction or aspiration:
: Of the blood
\+ (*c*) Turn out the clot

(c) **No-hæmatoma + compression:**

Tech: (1) **Explore brain & ventricles:**
: By aspiration

↓ (2) **Enlarge trephine hole:**
along: (a) Anterior branch:
: Fronto-parietal
(b) Middle branch:
: Temporo-parietal
(c) Posterior branch:
: Parieto-occipital

↓ (3) **Contre-coup trephine**

= (4) Palliative large bilateral trephine holes

Treatment: Of untoward signs and symptoms:

(A) *During the first 48 hours:*

(1) **Blood or cerebrospinal fluid oozing:**
(a) Mop with sterile gauze
(b) Do not plug or plug lightly
(c) Urotropine & sulphonamide therapy

(2) **Respiratory embarrassment:**
(a) Lateral position
(b) [illegible]

15°

(3) [illegible]
(a) Paraldehyde or bromides per rectum
(b) Sodium luminal 5 grs: intravenous
(c) Hyoscine

(4) **Signs of compression:** Decompress

(B) *After the first 48 hours:*

(1) **Persistence of unconsciousness:**
(a) Stomach feeds:
: 600 c.cs. of mixture of eggs + milk + sugar
: T. D S.
(b) Dehydration:
: Intravenous 200–300 c.cs. of 50% sucrose
: Every 6 hours

(2) **Cerebral irritation:**
: (See the treatment of irritation)

(3) **Lung complications:** Anti-pneumonia treatment

(V) **Sequelæ:**

(1) **Unresolved contusion:**

Etio: **Incomplete convalescence** from head injury

Path: **Vicious circle:**
(a) Œdematous contusion
↓ (b) Rise in intracranial tension
↓ (c) Venous obstruction → congestion
↓ (d) Œdema of the contusion

Clinic : (a) Recurrent throbbing headache
(b) Irritability
Treat : (1) Conservative : dehydration + sedatives (See under Irritation)
↓ (2) Decompression

(2) **Traumatic epilepsy :** (See under Epilepsy)

(III) INTRACRANIAL INFECTIONS :

Etio : (1) **Direct implantation :**
: Septic compound fracture
(2) **Extension from a neighbouring focus :**
(a) **Cranial focus :**
: Mastoiditis, sinusitis, osteomyelitis
(b) **Extracranial focus :** Facial carbuncle
(3) **Blood-borne :** Pyæmic metastases

(1) ACUTE MENINGITIS :

Etio : (1) Compound fracture skull
(2) **Cranial sepsis :**
(a) **Otitis media**
(b) Sinusitis
(c) Osteomyelitis skull
(3) **Blood-borne :**
(a) Meningo-coccal
(b) Pneumo-coccal
(c) Tuberculous

Bact : (1) Meningo-coccal
(2) Pneumo-coccal
(3) Pyococcal
(4) Tuberculous

Types : (A) Local : focal signs
(B) Diffuse : general irritation signs
(1) Acute
(2) Subacute
(3) Chronic
(4) Specific

Clinic : (1) **Focal** signs :
: Spasms, twitchings, convulsions, squint, pup changes, abnormal reflexes
(2) **General** intracranial tension signs :
: Of cerebral irritation
(3) Acute septic toxæmia
(4) **Lumbar puncture :**
(a) Pressure +
(b) Macroscopical exam : turbidity
(c) Microscopical exam.
(d) Cultural exam.

Treat: (1) **Symptomatic:** Sedatives
(2) Repeated cistern or **lumbar punctures**
(3) **Antiseptics:** Urotropine, sulphanilamide
(4) **Antisera**

(2) EPIDURAL OR EXTRA-DURAL ABSCESS:

Etio: **Extension from a local lesion:**
(1) **Intracranial:** Sinus thrombosis
(2) **Cranial:**
(*a*) Septic compound fracture
(*b*) Local cranial sepsis
(3) **Extracranial:** Boil, carbuncle

Path: **Pott's puffy tumour:**
(*a*) Collection of pus between dura and bone
\+ (*b*) Osteomyelitis of overlying bone
\+ (*c*) Inflamed and œdematous overlying scalp

Types: (*a*) Acute
(*b*) Subacute
(*c*) Chronic

Clinic: (1) **Compression:**
(*a*) **Focal:** Irritation → paralysis
(*b*) **Regional:** Irritation
(*c*) **General:** Cerebral irritation
(2) **Sepsis:**
(*a*) Local causative focus
(*b*) General toxæmia
(3) **Pott's puffy tumour**

Compl: (1) Meningitis
(2) Cerebral abscess
(3) Sinus thrombosis
(4) Intracranial compression

Treat: (1) **Operation:**
(*a*) Trephine
↓ (*b*) Excision of the overlying bone
↓ (*c*) Evacuation of pus
↓ (*d*) **Drainage**
(2) **Antiseptics**
(3) **Symptomatic**

(3) SINUS PHLEBITIS AND THROMBOSIS:

Etio: **Local suppurative focus → vein thrombosis → sinus thrombo-phlebitis:**
(1) Otitis media → lateral sinus
(2) Carbuncle face → cavernous sinus
(3) Nasal sepsis → superior longitudinal sinus
(4) Scalp sepsis → emissary vein thrombosis → sinus thrombo-phlebitis

Path: (1) Local suppurative focus
↓ (2) Emissary vein thrombosis and phlebitis

↓ (3) Sinus:
  (a) Phlebitis
  ↓ (b) Thrombosis
  ↓ (c) Suppuration
  ↓ (d) Embolism
  ↓ (e) Septicæmia

Clinic: (1) **Acute general sepsis:**
  : Rigors + high temperature
  (a) Septicæmia
  (b) Pyæmia
  (c) Toxæmia
  (d) Septic embolism

(2) **Intracranial signs:**
  (A) **Focal and regional:**
    : Meningitis and encephalitis
    (a) Lateral sinus: posterior basal signs
    (b) Cavernous sinus: eye signs
      (α) Proptosis
      (β) Chemosis
      (γ) Ophthalmoplegia
    (c) Superior longitudinal sinus:
      : Inferior extremities signs
  (B) **General tension:**
    (a) Irritative
    ↓ (b) Paralytic

(3) **Local signs:**
  (A) Signs of causative septic focus:
    : Otitis, sinusitis, carbuncle
  (B) Linear inflammation or chain of subcutaneous abscesses:
    : Over the line of the affected sinus
  (C) Hard, tender, cord-like vein: jugular

Individual signs: (1) Lateral sinus:
  (a) Posterior basal signs
  (b) Jugular vein thrombosis
(2) Cavernous sinus:
  : Ophthalmic signs
(3) Superior longitudinal sinus:
  : Motor cortex signs

General signs: (1) Intra-cranial tension signs
(2) General sepsis signs

Compl: (1) **Septic:**
  (A) Intra-cranial spread
  (B) Extra-cranial spread
  (C) Septic embolism: lungs
  (D) Septicæmia, pyæmia, toxæmia

(2) **Compression:** General intra-cranial tension

Treat: (1) **Prophylactic:**

Ind: Presence of a septic focus in the draining area with ascending œdema

Tech: (*a*) **Ligature of the afferent vein:**

: Between the septic focus and the sinus

\+ (*b*) Delicate handling of the primary focus

(2) **Therapeutic: Exploration → Drainage**

Ind: (A) Presence of a primary septic focus

\+ Rigors with oscillating temperature

(B) After the treatment of primary septic focus:

(1) Persistence of high temperature

or (2) Appearance de novo of high temperature

(C) During the operation for primary focus:

(1) Thrombosis of emissary vein

(2) Perforation or discolouration or inflammation of intervening bone

(3) Pus between the bone and the sinus

(4) Appearance of the sinus:

(*a*) Absence of respiratory pulsations

(*b*) [illegible]

(*c*) [illegible]

Tech: (1) **Ligature of efferent vein:**

(*a*) Lateral sinus:

: Right or left int. jugular vein

(*b*) Sup. long. sinus: Right int. jugular vein

(2) **Thorough exposure of the sinus:**

: By excision of the overlying bone

(3) **Treatment of the sinus:**

(*a*) Incision

↓ (*b*) Curettage

↓ (*c*) Packing

(4) **Drainage of the sinus:**

(*a*) Local:

(*b*) Orbital: in cavernous sinus

: Eagleton's combined operation:

(α) Common carotid ligature

\+ (β) Enucleation of eyeball

(*c*) Jugular: in

(α) Lateral sinus

(β) Sup. long. sinus: rt. jugular

After-treat: (1) Dressings:

(*a*) Primary septic focus

(*b*) Sinus drain

(2) Antiseptics: intravenous sulphonamides
intravenous iodine
intravenous dyes

(4) ABSCESS OF THE BRAIN: (See under Ear also)

Def: Suppurative softening of the brain:
- (*a*) Local: with definite capsulation
- (*b*) Regional: with indefinite wall
- (*c*) General: spreading cerebritis

Etio: (1) **Traumatic abscess:**
: Compound septic fracture skull

(2) **Extension abscess:**
- (*a*) Otogenic
- (*b*) Sinusitic
- (c) Osteomyelitis skull
- (*d*) Intracranial sepsis

(3) **Pyæmic abscess:**
- (*a*) Bronchiectasis
- (*b*) Lung abscess
- (*c*) Empyema

} : Thoracic sepsis

Path: (1) Primary focus
↓ (2) Extension to the brain: via
- (*a*) Direct spread
- (*b*) Venous spread
- (*c*) Lymphatic spread

↓ (3) Cerebral sepsis:
: Strictly localised encapsuled abscess
↓ Diffuse acute cerebral softening

Types: (A) **Acute** spreading cerebritis:
: Acute meningeal syndrome

(B) **Subacute** abscess:
: Rapid intracranial compression syndrome

(C) **Chronic** abscess:
: Cerebral tumour syndrome

Clinic: (A) **Sepsis syndrome:**

(1) **General:**
- : High intermittent or remittent fever
- : Rigors
- : Septic embolism
- : Septicæmia, toxæmia
- : Wasting & cachexia

(2) **Local:** Inflammation of:
- (*a*) Primary focus
- (*b*) Overlying tissues

(B) **Compression syndrome:**

(1) **Acute meningitis and cerebritis:**
: Rapid general irritation → compression

(2) **Subacute cerebral compression:**
- (*a*) Slow cerebration
- (*b*) Severe localised headache

(*c*) Vomiting
(*d*) Optic neuritis
(*e*) Slow pulse
(*f*) Subnormal temperature

(3) **Chronic: Cerebral tumour syndrome**

(C) **Focal syndrome:**

(1) **Frontal: Silent** area
(*a*) No focal signs
(*b*) Slow cerebration

(2) **Temporo-sphenoidal:**
(*a*) **Eye** signs: Pupillary signs
: Ptosis
(*b*) **Motor** signs: Hemiplegia
: Monoplegia
(*c*) **Special** signs: Auditory disturbances

(3) **Cerebellar:**
(*a*) **Cranial nerve** affections: 5th to 12th
(*b*) **Pons:**
: Spastic paralysis of opposite side
(*c*) **Cerebellar:**
(*α*) **Ocular:**
(1) Nystagmus
(2) Weak conjugation
(3) Skew deviation
(β) **Neck:** Rigidity
(γ) **Limb:**
(1) Incoordinated movements:
(i) Asynergia
(ii) Hypermetria
(iii) Dysdiadokokinesis
(iv) Component-resolvation of compound muscular action
(2) Homolateral hypotonic paresis
(3) Irregular reflexes
(δ) Catalepsy
(ε) Vertigo with staggering

Diagnosis: (1) Presence of a local septic focus
(2) Acute or chronic general sepsis
(3) Intra-cranial compression syndrome
(4) Focal syndrome
(5) Lumbar puncture: cautious
(6) Ventriculography

Compl: (1) **Sepsis:**
(*a*) Intracranial: acute meningitis
(*b*) General: septicæmia, septic embolism
(2) **Compression**

Sequelæ: (1) **Hernia cerebri:**
Treat: (*a*) Dehydration therapy
(*b*) Lumbar punctures: repeated
(2) Epilepsy
(3) Insanity or idiocy

Treat: (A) **General: Sulphonamide** therapy
(B) **Local: Exposure → exploration**
↓ **Evacuation → drainage**

Time: Definite capsulation: 3 weeks

Route: (*a*) **Along the primary focus**
(*b*) Direct:
: At its nearest approach to the surface
(α) Temporal:
: ·75" above supra-meatal spine
(β) Occipital:
(1) 1.5" behind meatal centre
+ (2) 1" below Reid's base line

Tech: (1) **Dandy's method: Aspiration**
: Exposure → Aspiration
(2) **Drainage: classical**
: Exposure → Evacuation → Drainage
(3) **King's method: Capsulectomy**
(*a*) Wide approach
↓ (*b*) Removal of overlying cortex
↓ (*c*) Removal of the overlying capsule
↓ (*d*) Evacuation of the pus
↓ (*e*) Irrigation of the cavity
↓ (*f*) Inspection of the cavity
↓ (*g*) Iodoform gauze pack
(4) **Marsupialisation:**
(*a*) Trephine hole 1.5" diam. over the abscess
(*b*) Radial incision of the dura
(*c*) Removal of overlying cortex
(*d*) Aspiration of the pus through the capsule
(*e*) Suture of the capsule to galea
(*f*) Wide incision of the capsule
(*g*) Gauze drain
(5) **Excision: of the abscess in toto**

Indications for opening the dura:
(1) Signs of subdural tension
(2) Signs of subdural sepsis

Post. Compl: (1) Spreading encephalitis
(2) Septic meningitis
(3) Œdema of the brain
(4) Infarction pneumonia

(IV) INTRACRANIAL TUMOURS:

Def: Tumour syndrome:
: A slowly progressive intracranial lesion
Etio: Age: (A) Childhood and adolescence
(B) Between 40 and 60

Varieties:

(A) CYSTS:

(*a*) **Congenital:**

(1) **Dermoids:**
(α) Extra-dural ↔ extracranial
(β) Subdural

(2) **Meningoceles:** (See page 741)
(α) Meningocele
(β) Encephalocele
(γ) Hydrencephalocele

Clinic: Congenital protrusion of intracranial contents through a cranial defect

(*b*) **Traumatic:**
(1) **Encapsuled hæmatoma**
(2) **Hæmorrhagic cyst:**
(α) Meningeal
(β) Intra-cerebral
(γ) Ventricular
(3) **Aerocele**

(*c*) **Inflammatory:** Localised serous meningitis
Etio: Otitis media
Site. Subdural in posterior chamber

(*d*) **Parasitic:**
(1) Cysticercus
(2) Echinococcus

(*e*) **New growths:**
(1) Gliomatous cyst
(2) Degeneration cyst

(B) ANEURYSMS:

(*a*) **Cerebral arteries:**
Sites: (α) Circulus arteriosus
(β) Lenticular
Etio: Congenital; childhood
Compl: Rupture:
(*a*) Headache
↓ (*b*) Sudden intracranial compression
↓ (*c*) Bloodstained cerebrospinal fluid
Diff. diag. Sunstroke

(*b*) **Internal carotid:** (See under Aneurysms)
(*a*) **Spontaneous arterial:**
Etio: Syphilis

Clinic: (*a*) Eye signs: paralysis, proptosis
(*b*) X-Rays: bone erosion

(β) **Arterio-venous:**

Etio: Fracture skull
Clinic: (*a*) Eye signs: pulsating exophthalmos
: ophthalmoplegia
(*b*) Bruit: audible
Treat: Ligature of ext. and int. carotid art.

(C) CHRONIC GRANULOMAS AND INFECTIONS:

(*a*) **Tuberculoma:**

Etio: Young age
Site: Posterior fossa; subcortical
Clinic: (*a*) Localising signs
(*b*) General tension signs
Compl: Tuberculous meningitis
Treat: (1) Complete excision:
: Avoid partial excision or biopsy
(2) Palliative decompression

(*b*) **Syphiloma:**

Path: (α) Cerebral gumma
(β) Meningeal gumma
(γ) Diffuse arachnoiditis: hydrocephalus

(*c*) **Chronic abscess:**

(α) Frontal
(β) Temporal
(γ) Cerebellar

(D) NEOPLASMS.

(*a*) *Skull:*

(1) Ivory exostosis or **osteoma:**
: Vault and air sinuses
(2) Primary **osteo-sarcoma:**
. Periosteal and central
(3) **Secondary** sarcoma or carcinoma:
Primaries: (α) **Thyroid**
(β) **Kidney**: Sarcoma in children
(γ) Breast
(δ) Prostate

(*b*) *Meninges:*

(1) **Benign endothelioma: Meningioma**
Etio: Adults
Path: Origin in arachnoidal villi
: Slow, encapsuled growth
: Involvement of dura and bone
Sites: (1) **Para-sagittal:**
: Associated with large venous sinuses

(2) **Basal :** Basal fossæ of the skull
(α) Anterior
(β) Temporal
(γ) Posterior
(3) Surface of the brain
(4) Falx cerebri

Clinic : (1) **Focal cerebral dysfunction :**
: Slowly progressive
(2) **Intracranial compression :**
: Slow or rapid
(3) **Cranial changes :**
(*a*) New bone formation
(*b*) Bone destruction
(*c*) Asymmetrical arrangement of cranial vessels

Cerebral syndrome : (1) Anterior syndrome :
(*a*) Psychic disturbances
(*b*) Double papillœdema
(2) *Middle syndrome :*
(*a*) Sensory
(*b*) Motor
(3) Posterior syndrome :
(*a*) Sensory disturbances
(*b*) Contralateral homonymous *hemianopia*

Treat : Radical removal

Contraind : (*a*) Vascularity
(*b*) Inaccessibility

(2) **Psammoma :** Calcified endothelioma

(3) ***Cholesteatoma :***
: Congenital subarachnoid tumour

(4) **Malignant endothelioma :** Local malignancy

(5) **Secondary carcinomatous deposits**

(6) **Melanomatous deposits**

(*c*) *Nerves :* (See under Nerves)

(1) **Auditory neuro-fibroma :**

Etio : Von Recklinghausen's disease
Site : **Cerebello-pontine** angle
Path : Lobulated, capsulated, benign, slow fibroma of the auditory nerve sheath
(*a*) Primary : solitary
(*b*) Secondary to Von Recklinghausen

Clinic : (1) Progressive **auditory** signs :
(α) Unilateral deafness
(β) Tinnitus
(γ) Vertigo

(2) Suboccipital pain
(3) **Cerebellar** signs
(4) Nerve signs:
(α) **Trigeminal:**
: Homolateral hyperæsthesia
(β) Ocular: diplopia
(γ) Facial: paresis
(5) **Intracranial tension** signs:
: Posterior fossa → int. hydrocephalus
(6) **X-Ray:** Erosion of interral auditory meatus or petrous bone

Treat: (1) **Operation:**
(a) Suboccipital exploration
↓ (b) Intracapsular: (α) Curetting
(β) Suction
(γ) Enucleation
↓ (2) Post-operative irradiation

(2) **Fibro-sarcoma**

(d) *Vessels:*

(1) **Cerebral telangiectasis:** Surface
Path: Capillary hæmangioma on cortical surface
Treat: (a) Exploration
+ (b) Cauterisation
↓ (c) Irradiation

(2) **Cerebellar angioblastoma:** Deep
Compl: (a) Hæmorrhage
(b) Cyst formation
Treat: Radical excision

(e) *Brain:*

(1) **Glioma:**
Etio: 40% of all intracranial tumours
Path: Composed of supporting tissue of the brain
Varieties: (α) **Astrocytoma:** Simple glioma
Age: Any
Site: Frontal lobe, cerebellum, pons
Path: Slow, avascular, cystic
Compl: Cyst formation
Treat: Excision
↓ Irradiation
(β) **Spongioblastoma:** Gliosarcoma
Age: **40-50** years

Site: Frontal
Temporal
Sylvian } : **Cerebral**

Path: Vascular
: Local malignancy
: Cystic degeneration

Clinic: Rapid and progressive rise in general intracranial tension with series of sudden cerebral attacks

Sign: Smoothened brain surface
Exploration

Treat Exploration
↓ Decompression
↓ Irradiation

(γ) Medulloblastoma:

Age: **Childhood**

Site: **Cerebellum**

Path: Round-celled sarcoma invading the meninges

Clinic. (1) Early morning headache
(2) Vomiting
(3) Int. hydrocephalus

Treat: Exploration:
↓ Decompression
↓ **Irradiation**

Compl: (1) Cyst formation
(2) Hæmorrhage
(3) Calcification

(2) Secondary malignant deposits:

Etio. (*a*) 20% of all brain tumours
(*b*) 3–5% of all malignant tumours metastasize in brain.
(*c*) Primaries:
(α) Bronchial carcinoma: 30%
(β) Melanotic sarcoma: 50%
(γ) Breast carcinoma
(*d*) Age: 40–60 years.

Clinic: (1) Pseudo-meningo-encephalitis signs
(2) Intracranial tension signs:
(*a*) Headache: severe paroxysm
↓ (*b*) Cerebral irritation
↓ (*c*) Coma
(3) Nature of the case:
(*a*) Elderly patient
(*b*) Short history
(*c*) Sudden onset
(4) Presence or history of primary focus

Treat: Palliative decompression

(*f*) *Ependymal growths:*

Path: (1) Spongioblastoma
(2) Blepharoplastoma
Site: Fourth ventricle
Clinic: Obstructive hydrocephalus

(*g*) *Appendages of the brain:*

(1) **Pituitary growths:** (See under Pituitary)

Class: (A) **Intra-sellar tumours:**

(1) **Adenoma:**

(*a*) **Chromophobe:**
Etio. Commonest
Age: 20–40
Clinic: Hypopituitarism

(*b*) **Chromophil:**
Age: After 30
Path: (α) Basophil
(β) **Eosinophil**
Clinic: Hyperpituitarism

(*c*) **Mixed or transitional:**
Age: 20–40
Clinic: Hypo + hyperpituitarism

(2) **Adeno-carcinoma:**
Age: After 45
Path: Chromophobe
Liver metastases
Clinic: (*a*) Primary signs
(*b*) Liver enlarged

(3) **Cranio-pharyngioma**

(B) **Supra-sellar tumours:**

(1) **Cranio-pharyngioma:**
Syn: Adamantinoma
Age: 10–20 years
Path: Slow cysts
Clinic: (*a*) Pressure signs:
(α) Local
(β) General
↓ (*b*) Hypo-pituitarism

(2) **Endothelioma**
(3) **Basal meningioma**
(4) **Aneurysm**

(2) **Pineal growths:**

Class: (1) Glioma
(2) Teratoma
Path: (*a*) Tendency to calcification
(*b*) Association with internal hydrocephalus

Clinic: (*a*) Local pressure signs
(*b*) Internal **hydrocephalus**
(*c*) X-Ray: **calcification**

Treat: Excision → Irradiation

Tech: (*a*) Tapping of hydrocephalus
↓ (*b*) Exploration:
(*α*) Dandy:
Right occipito-parietal osteoplastic flap
(*β*) Wagenen: Trans-ventricular approach
↓ (*c*) Excision of the tumour

Pathology of intracranial tumours:

(1) **Direct destruction** of local site:
: Focal paralysis
(2) **Pressure effects** on surroundings:
: Focal → regional; irritation → paralysis
(3) **Interference with cerebrospinal circulation:**
: Internal hydrocephalus
(4) Regional → general **rise in intracranial tension**
(5) **Special signs:** Pituitary dysfunction
(6) **Invasion:** Meninges, skull

Clinical features of intracranial tumours:

(1) **Focal syndrome:**
(A) Silent area: Temperamental and psychic changes
: Dementia
: Apathy
: Perversions
: Faulty judgement
: Lack of concentration
: Lack of memory
(B) Rolandic area:
: Twitchings → spasms → convulsions
↓ Paresis → paralysis
(C) Broca: Motor aphasia
(D) Temporal area: Auditory, taste, smell
(E) Occipital area: Hemianopia
(F) Cerebellum: Vertigo
: Nystagmus
: Incoordination of movements
: Ataxia
: Hypotonia
(G) Optic chaisma: Early visual disorders
(H) *Pons: Hyperthermia*
: Motor paralysis
: Pin-point pupils

(2) **Pressure syndrome :**

(A) **Regional :** Irritation → paresis → paralysis :
: Of surrounding centres, nerves or tracts

(B) **General :**

(1) Recurrent or persistent **headache**
(2) Recurrent **vomiting** without nausea
(3) **Visual** disorders :
(*a*) Diminished visual field
(*b*) Diplopia
(*c*) Squint
(*d*) Papillœdema : choked discs
Etio : Anterior chamber tension
Path : Compression of vein of Galen
↓ Hyperæmic choroid plexus
↓ Overproduction of C. S. F.
↓ Increased tension
↓ Compression of central vein of retina
↓ Papillœdema
= Venous congestion of disc
↓ (*e*) Optic atrophy
(4) **Bradycardia**
(5) **Slow cerebration**

(3) **Special signs :** Metabolic disorders
: **Pituitary dysfunction :**

(A) **Hyperpituitarism :**
(*a*) Juvenile : Gigantism
(*b*) Adult : Acromegaly

(B) **Hypopituitarism :**
(*a*) **Juvenile :**
(1) **Frölich :**
(*a*) **Obesity**
(*b*) Normal growth
(*c*) Sex infantalism
(*d*) Low basal metabolism
(*e*) Increased sugar tolerance
(2) **Simmond ;**
(*a*) **Cachexia**
(*b*) As in (1)
(*b*) **Adult :**
: **Lorain :**
(*a*) **Dwarfism**
(*b*) Sex infantalism
(*c*) Hypotrichosis

(C) **Cushing's pituitary basophilism :**
(*a*) Trunk adiposity
(*b*) Kyphosis

- (c) Amenorrhœa—impotence
- (d) **Hypertrichosis**
- (e) **Vascular hypertension**
- (f) **Erythræmia**
- (g) Debility

Investigations in intracranial tumour syndrome:

(1) **Site:** (Local)

(A) **Palpation of the head:**

- (a) Cracked-pot note
- (b) Local tenderness
- (c) Local swelling

(B) **Neurological examination**

(2) **Nature:**

(A) **Age:**
- (a) Children: T. B.
- (b) Adolescents: meningitis
- (c) Adults: gumma
- (d) Seniles: secondaries

(B) **History:**
- (a) Slow: meningioma
- (b) Rapid: malignancy
- (c) Intermittent: granulomas

(3) **Examination of other systems:**

- (1) Circulatory: blood pressure
- (2) Urinary. diabetes
- (3) Specific: syphilis, tubercle
- (4) Malignancy
- (5) Septic focus

(4) **Special tests:**

(A) **Fundus** and visual field examination

(B) **X-Ray:**
- (a) Direct evidence: calcification
- (b) Indirect evidence:
  - (α) Separation of sutures
  - (β) Bony changes:
    - (1) Erosion
    - (2) New formation
    - (3) Rearrangement of vessels
  - (γ) Distorted pituitary fossa
  - (δ) Pineal shift

(C) **Cerebrospinal fluid:**

Routes:
- (1) Cistern puncture:
  : Through atlanto-occipital membrane
- (2) Spinal puncture

Exam:
- (a) Pressure (Queckenstedt's test)
- (b) Physical, chemical, bacteriological
- (c) W. R.

(D) **Ventricular investigations:**

(1) **Puncture:**

Route: (*a*) 7 cms. above external occipital process + 1.5 cms. lateral to midline, needle towards centre of corresponding eye
(*b*) 3 cms. above & behind ext. aud. meatus

Note: (*a*) Resistance to the needle
(*b*) Depth from the surface
(*c*) Amount and character of fluid
(*d*) *Difference in the volume of fluid from* the two ventricles: more than 10 c.cs. is pathological

(2) **Ventriculography:**

(*a*) Ventricular puncture
↓ (*b*) Aspiration of ventricular fluid
↓ (*c*) Replacement by air
↓ (*d*) Radiography

Tech: (1) Bilateral trephine:
(α) 1" on either side of midline
(β) 2" above the lambdoidal suture
(2) Dural incision
(3) Introduction of needle:
: *Downwards + forwards + inwards*
(Towards the centre of the corresponding eye).
(4) Aspiration of fluid
(5) Introduction of air: 50-120 c cs.
(6) Closure
(7) X-Rays:
(*a*) Lateral
(*b*) Antero-posterior
(*c*) Postero-anterior
(*d*) Special head-down position: for IV ventricle

Shows: (*a*) Internal hydrocephalus
(*b*) Site of obstruction

(3) **Ventricular estimation:**

(*a*) Ventricular puncture
↓ (*b*) Aspiration of ventricular fluid
↓ (*c*) Injection of dye

(E) **Encephalography:**

: Less risky than (D) above and less certain also

Def: Air replacement of C. S. fluid via lumbar puncture:

Tech: (*a*) Lumbar puncture
(*b*) Slow withdrawal of fluid
(*c*) Slow introduction of air: 20-25 c.cs.
(*d*) X-Ray after one hour:
(α) Antero-posterior
(β) Lateral

Contraind : Increased intra-cranial pressure
Sequelæ : Headache + vomiting :
: (Keep in head-low position and give sedatives)

(F) **Lipoidol ascendant**

(G) **Thorotrast :** Into internal carotid artery

(H) **Exploratory craniotomy :**
Ind : **Every case of progressive papillœdema**

Treatment : of intra-cranial tumours :

(1) ***Radical removal :***
Ind : (a) **Meningiomata**
(b) **Pituitary tumours**
(c) **Suprasellar** cranio-pharyngiomata
(d) ***Accoustic*** *neurinomata*
(e) **Innocent gliomata**

Tech : (1) **Osteoplastic resection of the skull :**
(A) Transfrontal : supratentorial basal
(B) Lateral parieto-temporal : cerebral hemisphere
(C) Suboccipital : infratentorial
(D) Trans-sphenoidal : pituitary
(E) Right occipito-parietal : pineal
(F) Subtemporal : palliative decompression

(2) **Incision of the dura :**
Ind : Signs of subdural compression
Contraind : Extradural sepsis

(3) **Exploration** for the tumour

(4) **Removal of the tumour :**
(A) Meningioma :
(a) *Parasagittal :*
(α) Cautery removal
(β) Shelling out
(γ) Removal with falx and sinus
(b) *Basal :*

	Site	*Route*
(α)	Prefrontal :	transfrontal
(β)	Temporal :	subtemporal
(γ)	*Posterior* :	*suboccipital*

(B) Glioma :
(a) Astrocytoma : radical removal
(b) Spongioblastoma : } ↓ Decompression
(c) *Medullo-blastoma :* } *Irradiation*

(C) Accoustic neuroma :
(a) Intracapsular suction
(b) Intracapsular curettage

(D) Pituitary :
(a) Suprasellar : removal or **suction**
(b) Infrasellar : basal decompression

(E) Pineal : removal
↓ irradiation

(F) Angiomata :
(a) Small : diathermy
(b) Large : irradiation

(5) **Closure :**
(a) Complete removal : osteoplastic
(b) Incomplete removal : boneless flap

Difficulties : (1) Cessation of respiration :
Etio : Subtentorial growths
Treat : Artificial respiration
+ Rapid relief of tension
(2) Injury to venous sinuses :
Etio : Parasagittal meningioma
(3) Dural laceration
(4) Brain laceration
(5) Escape of cerebrospinal fluid
(6) Bleeding from :
(a) Scalp
(b) Bone
(c) Venous sinuses
(7) Difficulty of access

(II) **Palliative decompression :**

Ind : (1) Inoperable tumours : with
(a) Severe and persistent headache
(b) Failing eyesight
(c) Frequent and severe fits
(d) Pronounced cerebral vomiting
(e) Insomnia or delirium
(2) Preliminary to radical removal
(3) Preliminary to deep X-Ray therapy
(4) Preliminary to antisyphilitic treatment

Methods : (A) **Trephining :**
Site : (1) **Directly over the tumour**
(2) On the side of the tumour
(3) *Bilateral : temporal*
(4) Suboccipital
Size : Larger than the tumour

(B) **Ventricular drainage :** Of Learmouth
Ind : (a) Pre-operative decompression
(b) Post-operative decompression
(c) Hernia cerebri
Tech : (a) Burr hole
(b) Tapping by posterior route
(c) Insertion of rubber cannula on a stilette
Compl : Infection

Prognosis: Fatality: (1) Tuberculomata : 29%
(2) Metastatic tumours : 21%
(3) Gliomata : 19·5%
(4) Accoustic tumours : 12·5%
(5) Meningiomata : 11·5%
(6) Pituitary adenomata : 6%

(V) HERNIA CEREBRI:

Def: Hernial protrusion of the brain tissue through a deficiency in the skull

Etio: (1) Septic **compound fracture** of the skull
(2) **Post-operative:**
(*a*) Intracranial tension rise
(*b*) Intracranial sepsis
(c) Intracranial progressive tumour

Path: Varieties: (1) Closed: scalp intact
(2) Open

(1) **Acute:** Due to acutely rising intracranial tension
(*a*) Œdema
(*b*) Sepsis
(*c*) Rapid tumour

(2) **Chronic:** Due to slow rise in intracranial tension
(*a*) Innocent tumour
(*b*) Chronic sepsis

Clinic: (1) **Closed:** Soft, irregular, pulsating mass protruding from a trephine opening and covered by the scalp.
or (2) **Open:** Soft, irregular, pulsating mass protruding through a defect in the skull and the scalp and lined by granulations.
+ (3) Signs of interference with the brain function:
(*a*) Local
(*b*) General rise in intracranial tension

Compl: (1) Strangulation and softening
(2) Trauma
(3) Intracranial sepsis: meningitis, abscess

Treat: (1) Removal of the etiology:
(*a*) Œdema
(*b*) Sepsis
(*c*) Tumour

(A) Acute hernia:
(1) Repeated lumbar punctures
(2) Dehydration therapy: (See above)
(*a*) Rectal mag. sulph.
(*b*) Intravenous sucrose
(3) Enlargement of trephine opening:
: If strangulation

(B) Chronic hernia:
- (1) Prophylactic:
  - : Avoidance of simple, palliative decompression where total or partial excision is possible
- (2) Therapeutic:
  - (*a*) Protection
  - (*b*) Excision
  - (*c*) Radiotherapy: in malignant tumours

(VI) EPILEPSY:

(1) **Idiopathic:**
- (A) Generalised: leave it alone
- (B) Local → generalised:

Treat: Medical:
- (*a*) Luminal
- (*b*) Sodium diphenyl-hydantoinate

Dose: ·1 gm. T.D.S. after meals
Compl: Toxic symptoms
Cantraind: (α) Debility
- (β) Arteriosclerosis
- (γ) Cardio-renal disease

(2) **Secondary:**
- (A) Jacksonian }
- (B) Generalised }

Etio: (*a*) Trauma: depressed fracture
: cerebral adhesions
- (*b*) Pressure: intracranial tumour
- (*c*) Hernia cerebri

Treat: (1) Excision of the depressed fracture
- (2) Excision of the tumour
- (3) Treatment of hernia cerebri
- (4) Excision of the scar tissue
- (5) Interposition at the aperture:
  - (*a*) Autogenous bone graft
  - (*b*) Cartilaginous graft
  - (*c*) Perforated silver plate
  - (*d*) Celluloid plate
- (6) Decompression:
  Ind: Irremovable rise in intracranial pressure

Causes of failure: After operative interference
- (1) Unsuitable cases: idiopathic
- (2) Epilepsy habit
- (3) Septic complications
- (4) Reformation of adhesions

(VII) CEREBRAL PARALYSIS:

Types: (1) Infantile hemiplegia
- (2) Spastic diplegia

(3) Spastic paraplegia
(4) Monoplegia

Etio: (1) Congenital defects
(2) Prenatal syphilis
(3) Asphyxia neonatorum
(4) **Birth trauma**: Hæmatoma
(5) Intracranial infections

Path: (1) Spasm stage
↓ (2) Accommodative contractures
↓ (3) Fixed deformities

Clinic: (1) History of delay in standing and walking
(2) Mental deficiency and irritability
(3) Paralysis of upper motor neurone type:
(*a*) Spasms
(*b*) Exaggerated reflexes
(*c*) Absence of trophic changes
(4) Deformities:

(A) Upper extremity:

Part	*Position*
Shoulder	Slight abduction
Elbow	Flexion
Forearm	Pronation
Wrist	Flexion
Thumb	Adduction

(B) Lower extremity:

Part	*Position*
Hip	Flexion
Thigh	Adduction
Knee	Flexion
Foot	Equino-varus

Treat: (1) **Prophylactic**:
(*a*) Manipulations
(*b*) Splints
(*c*) **Physiotherapy** (but no electrotherapy)
(*d*) Muscle education

(2) **Operative**:
(A) **Tendon operations**:
(1) Lower extremities:
: **Tenotomies**:

	Tendons.	*Indications.*
(1)	Tendo Achilles	Talipes equinus
(2)	Steindler	Pes cavus
(3)	Hamstrings	Knee flexion
(4)	Adductors	Hip adduction

Aftertreat: (α) Rest in bed;
: With extremities in abduction splint for 3-8 weeks
(β) Physiotherapy and exercises

(2) Upper extremities:

(*a*) **Tendon transplantations:**

Ind: Drop wrist

Tech:	*Donor*	*Recipient*
	Flexors carpi	Finger extensors

After-treat: Cock-up splint + physiotherapy

(*b*) **Partial resection:** pronator radii

(B) **Nerve operations:**

: **Stoffel neurectomy:**

(1) Section of motor tracts in a nerve

(2) Excision of motor branch to a muscle

Nerve.	*Indication.*
(1) Obturator	: Thigh adduction
(2) Gluteal	: Thigh inversion
(3) Hamstrings	: Knee flexion
(4) Calf muscles	: Talipes equinus
(5) Pronator radii	: Forearm pronation
(6) Flexor sublimis	: Finger flexion
(7) Flexor pollicis	: Thumb flexion

(VIII) CRANIOTOMY OR TREPHINING:

Def: Making an opening in the skull with or without the removal of the bone disc and with or without the opening of the dura:

(A) **Therapeutic:**

: To treat any intra-cranial lesion

(B) **Palliative:**

: To allow expansion of the brain, so as to relieve intra-cranial tension

Ind: (1) TREATMENT OF CRANIAL AND INTRACRANIAL CONDITIONS:

(A) **Congenital:**

(*a*) Hydrocephalus

(*b*) Meningocele

(*c*) Intra-cranial dermoid

(B) **Trauma:**

(*a*) **Primary: Fracture skull**

(α) Compound fracture skull

(β) Depressed fracture skull

(γ) Bullet fractures

(*b*) **Intermediate:**

: Compression and sepsis

(α) Compression:

: Intra-cranial hæmorrhage

(β) Sepsis:

: Intra-cranial or cranial traumatic

(c) **Late: Sequelæ**
- (α) Unresolved contusion
- (β) Traumatic epilepsy

(C) **Infection:**
- (a) Acute and chronic cranial osteomyelitis
- (b) Intra-cranial abscess:
  - (α) Extra-dural
  - (β) Subdural
  - (γ) Cerebral
- (c) Sinus thrombosis

(D) **Intra-cranial and cranial new growths:**
- (a) Radical removal
- (b) Preliminary to irradiation

(2) PALLIATIVE DECOMPRESSION:

Ind: [illegible]

- (1) Breaking of vicious circle
- (2) Inaccessibility
- (3) Inoperability
- (4) Failure of diagnosis of site

Etio:
- (a) Congenital conditions
- (b) Traumatic: cerebral œdema
  : unresolved contusion
- (c) Intracranial sepsis:
  : Intractable and prolonged
- (d) Intracranial new growths:
  : Irremovable

Sites:

	Sites	*Indications*
(1)	**Transfrontal**:	Anterior cerebral basal lesions
(2)	**Temporal**	: (A) Lateral cerebral lesions
		(B) Anterior chamber tension
		(C) Trigeminal ganglionectomy
(3)	**Occipital**	: (A) Cerebellar lesions
		(B) Cerebello-pontine tumour
		(C) Posterior chamber tension
		(D) Trigeminal ganglionectomy
(4)	**Trans-sphenoidal**:	Pituitary decompression
(5)	**Local**:	Anywhere over the seat of the lesion

Pre-operative treatment:

(1) Dehydration treatment:

Ind: High intracranial tension

Tech:
- (a) Intravenous glucose or sucrose
- (b) Rectal mag. sulph.

(*c*) **Late: Sequelæ**
- (α) Unresolved contusion
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  - Tech: (*a*) Intravenous glucose or sucrose
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(2) Oxygen and CO_2 apparatus
(3) Blood pressure estimation during the operation

Position: Semi-sitting
Anæsthesia: Light ether with local or regional novocain
Technique:

(1) **Flaps:**
- (A) **Frontal:** Ear to ear across the bregma in coronal plane
- (B) **Temporal:**
  - (a) Semicircular ·5" more than bone flap
  - or (b) Vertical incision 3"–4", midway between external angular process and pinna, upto ·5" above the mid-point of zygoma
  - or (c) Vertical incision:
    - : From the top of the ear to mid-line
    - : (In palliative decompression)
- (C) **Occipital:**
  - (a) Cross-bow
  - or (b) Mid-line vertical: lambda to 7c.
- (D) **Semivertex and whole vertex**

(2) **Muscle treatment:**
- (a) Reflection
- (b) Split: in
  - (α) Decompression
  - (β) Lesions requiring small exposures

(3) **Reflection of periosteum**

(4) **Trephining:**

Methods: (A) **Hand trephine:**
- (a) Remove the pin after settling
- (b) Test the depth now and then

(B) **Brace and burr**
(C) **Jæntzner trephine**
(D) Souttar's craniotome
(E) De Martel's electric trephine

(5) **Separation of dura** from the bone

(6) **Enlargement of trephine opening:**
- (A) **Craniectomy:**
  - : Removal of the bone disc with enlargement of the aperture by nibbling forceps
- (B) **Craniotomy:**
  - : Osteoplastic resection of the skull with retention of bevelled bone in the flap

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(D) **Intra-cranial and cranial new growths:**
- (*a*) Radical removal
- (*b*) Preliminary to irradiation

(2) PALLIATIVE DECOMPRESSION:

Ind: **Raised intracranial tension leading to cerebral compression where radical treatment is not possible or required**
- (1) Breaking of vicious circle
- (2) Inaccessibility
- (3) Inoperability
- (4) Failure of diagnosis of site

Etio:
- (*a*) Congenital conditions
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(4)	**Trans-sphenoidal**	Pituitary decompression
(5)	**Local**	Anywhere over the seat of the lesion

Pre-operative treatment:

(1) Dehydration treatment:

Ind: High intracranial tension

Tech: (*a*) Intravenous glucose or sucrose
- (*b*) Rectal mag. sulph.

(2) Oxygen and CO_2 apparatus

(3) Blood pressure estimation during the operation

Position: Semi-sitting

Anæsthesia: Light ether with local or regional novocain

Technique:

(1) **Flaps:**

(A) **Frontal:** Ear to ear across the bregma in coronal plane

(B) **Temporal:**

(*a*) Semicircular ·5" more than bone flap

or (*b*) Vertical incision 3"–4", midway between external angular process and pinna, upto ·5" above the mid-point of zygoma

or (*c*) Vertical incision:

: From the top of the ear to mid-line

: (In palliative decompression)

(C) **Occipital:**

(*a*) Cross-bow

or (*b*) Mid-line vertical: lambda to 7c.

(D) **Semivertex and whole vertex**

(2) **Muscle treatment:**

(*a*) Reflection

(*b*) Split: in

(α) Decompression

(β) Lesions requiring small exposures

(3) **Reflection of periosteum**

(4) **Trephining:**

Methods: (A) **Hand trephine:**

(*a*) Remove the pin after settling

(*b*) Test the depth now and then

(B) **Brace and burr**

(C) **Jæntzner trephine**

(D) Souttar's craniotome

(E) De Martel's electric trephine

(5) **Separation of dura** from the bone

(6) **Enlargement of trephine opening:**

(A) **Craniectomy:**

: Removal of the bone disc with enlargement of the aperture by nibbling forceps

(B) **Craniotomy:**

: Osteoplastic resection of the skull with retention of bevelled bone in the flap

(c) **Late: Sequelæ**
(α) Unresolved contusion
(β) Traumatic epilepsy

(C) **Infection:**
(a) Acute and chronic cranial osteomyelitis
(b) Intra-cranial abscess:
(α) Extra-dural
(β) Subdural
(γ) Cerebral
(c) Sinus thrombosis

(D) **Intra-cranial and cranial new growths:**
(a) Radical removal
(b) Preliminary to irradiation

(2) PALLIATIVE DECOMPRESSION:
Ind: **Raised intracranial tension leading to cerebral compression where radical treatment is not possible or required**
(1) Breaking of vicious circle
(2) Inaccessibility
(3) Inoperability
(4) Failure of diagnosis of site

Etio: (a) Congenital conditions
(b) Traumatic: cerebral œdema
: unresolved contusion
(c) Intracranial sepsis:
: Intractable and prolonged
(d) Intracranial new growths:
: Irremovable

Sites:

	Sites	*Indications*
(1)	**Transfrontal**	Anterior cerebral basal lesions
(2)	**Temporal**	(A) Lateral cerebral lesions (B) Anterior chamber tension (C) Trigeminal ganglionectomy
(3)	**Occipital**	(A) Cerebellar lesions (B) Cerebello-pontine tumour (C) Posterior chamber tension (D) Trigeminal ganglionectomy
(4)	**Trans-sphenoidal**	Pituitary decompression
(5)	**Local**	Anywhere over the seat of the lesion

Pre-operative treatment:
(1) Dehydration treatment:
Ind: High intracranial tension
Tech: (a) Intravenous glucose or sucrose
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(2) Oxygen and CO_2 apparatus
(3) Blood pressure estimation during the operation

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(C) **Occipital:**

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(D) **Semivertex and whole vertex**

(2) **Muscle treatment:**

(*a*) Reflection
(*b*) Split: in
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Ind: [illegible]

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- (3) Inoperability
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Etio:
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(4)	**Trans-sphenoidal**:	Pituitary decompression
(5)	**Local**:	Anywhere over the seat of the lesion

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Ind: High intracranial tension

Tech:
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(2) Oxygen and CO_2 apparatus
(3) Blood pressure estimation during the operation

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- (B) **Craniotomy:**
  : Osteoplastic resection of the skull with retention of bevelled bone in the flap

(7) Inspection and treatment of dura:
Note: (*a*) Subdural tension
(*b*) Dural pulsations
(*c*) Dural colour

(8) Opening dura by crucial incision:
Ind: (*a*) Subdural tension:
(α) Traumatic
(β) Septic
(γ) New growth
(*b*) Subdural infection
(*c*) Subdural and dural laceration
(*d*) Subdural new growth
Contraind: (*a*) No signs of subdural tension
(*b*) Extra-dural sepsis:
(α) Actual
(β) Potential

(9) Treatment of the primary condition

(10) Closure:
(A) **Osteoplastic:** Craniotomy
Ind: (1) Radical removal of tension cause
+ (2) No sepsis: actual or potential
(B) **Disc-less:** Craniectomy
Ind: (1) Palliative decompression
(2) Sepsis: actual or potential
(3) Cause of compression:
(α) Partial removal
(β) Chance of recurrence
(γ) Need of irradiation

Difficulties and dangers:

(1) Hæmorrhage:
(A) *Scalp:*
(*a*) Rubber tourniquet round the skull base
(*b*) Special clamps: Ballance
Sargent
Makkas
(*c*) Injection of novocain with adrenaline
(*d*) **Eversion of galea:**
: Over cut margin of skin incision
(*e*) Blanket or **continuous margin stitch**
(B) *Bone:*
(*a*) Compression of the bone
(*b*) Horsley's wax: carbolic acid: 1 part
olive oil: 2 parts
yellow wax: 7 parts
(*c*) Foramen plugging
(*d*) **Muscle graft**

(C) *Dura :*
(*a*) Hot irrigations
(*b*) **Under-running sutures**
(*c*) Silver clips
(*d*) Cautery

(D) *Sinuses :*
(*a*) **Postage stamp**
(*b*) Muscle graft
(*c*) **Plugging**
(*d*) Ligature of both ends

(E) *Brain :*
(*a*) **Muscle graft**
(*b*) Pack

(F) *Inaccessible depth of skull base :*
: Ligature of ext. or common carotid art.
: (For uncontrollable hæmorrhage)

(2) **Cessation of respiration :**
Etio : Posterior chamber operations
Treat : (*a*) Sitting posture
(*b*) **Rapid trephining**
(*c*) Lumbar puncture
(*d*) Artificial respiration

(3) **Mechanical and anatomical difficulties**

(4) **Too great intracranial pressure :**
Treat : (*a*) **Enlarge the trephine opening**
(*b*) Tap the ventricles
(*c*) Cautious spinal puncture
(*d*) **Pre and post dehydration therapy**

Post-compl : (1) **Shock :**
Treat : (*a*) Blood transfusion
(*b*) Black coffee per rectum : 6 oz.
(*c*) Glucose intravenous

(2) **Internal hæmorrhage :**
Clinic : (*a*) Persistent uncontrollable pain
(*b*) Restlessness
(*c*) Slow respiration
Treat : Reopen and treat the focus

(3) **Vomiting :** After cerebellar operations

(4) **Headache :**
Treat : Repeated lumbar punctures
: Dehydration therapy

(5) **Mania :** After frontal lobe operations

(6) **Hyperpyrexia :**
Treat : Wrap up in wet blanket or cold breeze or air blast on extremities

(7) Inspection and treatment of dura:
Note: (*a*) Subdural tension
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(*c*) Dural colour

(8) Opening dura by crucial incision:
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(7) **Lung complications:** Œdema of the lungs
: Pneumonia

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(9) **Hernia cerebri**

Post-operative irradiation:

Ind: Malignant growths

Tech: (*a*) Decompression

↓ (*b*) Deep X-Ray or radium: after 2 weeks

(IX) IMPORTANT POINTS

(I) TRAUMA:

(A) **Fracture skull:**

(1) Even a severe local deformation (depressed) fracture of the skull may be unaccompanied by slightest concussion. Compression may develop as a result of œdema of the brain due to local contusion or laceration.

(2) There are only two contraindications for operation in fracture skull:

(*a*) Hopeless condition

(*b*) General deformation fracture with no compression signs.

(3) Brain complications of fracture skull are:

(*a*) Concussion

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(*c*) Œdema

(*d*) Compression: due to

(α) Depressed fracture

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(γ) Œdema

(δ) Sepsis

(*e*) Sepsis

(*f*) Adhesions

(*g*) Hernia cerebri

(*h*) Neurosis.

(4) Treatment of fracture skull:

(1) Local deformation: always operate

(2) General deformation:
: Expectant unless compression.

(5) Do not forget to examine all other parts of the body in a case of fracture skull.

(B) **Concussion:**

(6) Traumatic unconsciousness—concussion—is a purely physiological state.

(7) Main clinical features of concussion are:

(1) Instantaneous and widespread onset

(2) Simultaneously widespread paralysis of all brain functions
(3) Spontaneous and sudden recovery
(4) Retrograde amnesia.

(8) Retrograde amnesia is present in and pathognomonic of every case of concussion and is of medico-legal importance. No concussed person ever knows the exact details of his accident.

(9) Hæmatemesis after concussion period:
? (a) Swallowed blood: from
(α) Skull base
(β) Pharynx
(γ) Lungs.
? (b) Injury to the stomach.

(10) Vomiting augurs the recovery from concussion

(11) In most cases of head injury, the less we do in the stage of concussion, the better.

(C) **Hæmorrhage:**

(12) In extra-dural hæmorrhage:
(a) Lucid interval varies from 7 hours to 21 days
(b) Ipsilateral fixed dilated pupil is very common

(13) Extra-dural hæmorrhage:
(a) Slow, gradual extension of symptoms and signs:
(α) In stages: irritative → paralytic
(β) In areas: local → regional → unilateral → bilateral → subtentorial
(b) Latent silent period
(c) Inequality of signs on both sides.

(14) Two main causes of mortality in middle meningeal hæmorrhage:
(a) Failure to operate or delay in operating
(b) Concomitant laceration of the brain.

(15) *During first forty-eight hours*, increased intracranial tension must be due to intracranial hæmorrhage, either extra-dural or subdural. *Dehydration should not be practised* during this period.

(16) The primary task of a surgeon faced with head injury will be to exclude as early as possible the possibility of a surgical clot or to operate on it when he suspects it.

(17) In traumatic intracranial hæmorrhage, whether epidural or subdural, one should operate on suspicion rather than wait for text book pictures.

(18) Subdural diffuse and intraventricular hæmorrhages are rapidly fatal and are contraindications for operative treatment.

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(17) In traumatic intracranial hæmorrhage, whether epidural or subdural, one should operate on suspicion rather than wait for text book pictures.

(18) Subdural diffuse and intraventricular hæmorrhages are rapidly fatal and are contraindications for operative treatment.

(7) **Lung complications**: Œdema of the lungs
: Pneumonia

(8) **Intracranial sepsis**

(9) **Hernia cerebri**

Post-operative irradiation:

Ind: Malignant growths

Tech: (*a*) Decompression
↓ (*b*) Deep X-Ray or radium: after 2 weeks

(IX) IMPORTANT POINTS

(I) TRAUMA:

(A) **Fracture skull**:

(1) Even a severe local deformation (depressed) fracture of the skull may be unaccompanied by slightest concussion. Compression may develop as a result of œdema of the brain due to local contusion or laceration.

(2) There are only two contraindications for operation in fracture skull:
(*a*) Hopeless condition
(*b*) General deformation fracture with no compression signs.

(3) Brain complications of fracture skull are:
(*a*) Concussion
(*b*) Contusion and laceration
(*c*) Œdema
(*d*) Compression: due to
(α) Depressed fracture
(β) Hæmorrhage
(γ) Œdema
(δ) Sepsis
(*e*) Sepsis
(*f*) Adhesions
(*g*) Hernia cerebri
(*h*) Neurosis.

(4) Treatment of fracture skull:
(1) Local deformation: always operate
(2) General deformation:
: Expectant unless compression.

(5) Do not forget to examine all other parts of the body in a case of fracture skull.

(B) **Concussion**:

(6) Traumatic unconsciousness—concussion—is a purely physiological state.

(7) Main clinical features of concussion are:
(1) Instantaneous and widespread onset

(2) Simultaneously widespread paralysis of all brain functions
(3) Spontaneous and sudden recovery
(4) Retrograde amnesia.

(8) Retrograde amnesia is present in and pathognomonic of every case of concussion and is of medico-legal importance. No concussed person ever knows the exact details of his accident.

(9) Hæmatemesis after concussion period:
? (*a*) Swallowed blood: from
(α) Skull base
(β) Pharynx
(γ) Lungs.
? (*b*) Injury to the stomach.

(10) Vomiting augurs the recovery from concussion

(11) In most cases of head injury, the less we do in the stage of concussion, the better.

(C) **Hæmorrhage:**

(12) In extra-dural hæmorrhage:
(*a*) Lucid interval varies from 7 hours to 21 days
(*b*) Ipsilateral fixed dilated pupil is very common

(13) Extra-dural hæmorrhage:
(*a*) Slow, gradual extension of symptoms and signs:
(α) In stages: irritative → paralytic
(β) In areas: local → regional → unilateral → bilateral → subtentorial
(*b*) Latent silent period
(*c*) Inequality of signs on both sides.

(14) Two main causes of mortality in middle meningeal hæmorrhage:
(*a*) Failure to operate or delay in operating
(*b*) Concomitant laceration of the brain.

(15) *During first forty-eight hours*, increased intracranial tension must be due to intracranial hæmorrhage, either extra-dural or subdural. *Dehydration should not be practised* during this period.

(16) The primary task of a surgeon faced with head injury will be to exclude as early as possible the possibility of a surgical clot or to operate on it when he suspects it.

(17) In traumatic intracranial hæmorrhage, whether epidural or subdural, one should operate on suspicion rather than wait for text book pictures.

(18) Subdural diffuse and intraventricular hæmorrhages are rapidly fatal and are contraindicati[illegible] operative treatment.

(19) The intracranial hæmorrhages amenable to treatment are:
 (*a*) Extra-dural
 (*b*) Localised subdural

(20) Hæmorrhage, once started in the cranial cavity is progressive and calls urgently for immediate operative treatment.

(21) Chronic subdural hæmatoma is the commonest cause of a local alteration in the contour of a child's skull.

(22) Subdural hæmatomas follow in about 9–13% of all severe head injuries.

(23) Subdural hæmorrhage is more frequent than extra-dural.

(24) In all head injuries, it is most important to diagnose:
 (*a*) Presence of intracranial hæmorrhage
 (*b*) Site of the hæmorrhage.

(25) Diagnosis of the site of intracranial hæmorrhage:
 (*a*) Focal signs: spasms or paralysis
 (*b*) Pupils
 (*c*) Local trauma: of the overlying structures
 (*d*) Lumbar puncture.

(26) Causes of intracranial hæmorrhage:
 (1) Apoplexy
 (2) Traumatic
 (3) Ruptured aneurysm
 (4) Hæmorrhage into gliomas
 (5) Angiomatous tumours.

(27) If a middle meningeal hæmatoma is found to be extending towards occipital region, do not go on nibbling posteriorly. Make a second incision and trephine for posterior branch.

(D) Contusion—laceration—œdema of the brain:

(28) Patients who remain unconscious for hours or days are suffering from something more than concussion: viz. contusion, laceration or hæmorrhage.

(29) It is only after the first forty-eight hours that the surgeon has to worry about cerebral œdema, the treatment of which is dehydration, which can best be done by intravenous injections of 50–100 c.cs. of 50% glucose or 200–300 c.cs. of 50% sucrose.

(30) Cerebral laceration with intra-dural hæmorrage is more frequent than extra-dural hæmorrhage.

(31) Symptoms due to cerebral œdema alone are:
 (*a*) Only irritative—not developing into paralytic
 (*b*) Widespread.

(E) Traumatic compression :

(32) Compression of the brain: gradually increasing interference with the cerebral circulation and consequent interference with the functions of the brain.

(33) The classical signs of cerebral compression:
(*a*) Dilated non-reacting pupils
(*b*) Slow sterterous breathing
(*c*) Bradycardia with hyperpiesia
(*d*) Coma.
: These are the signs of impending death and show that the period of grace has gone by.

(34) All cases of early acute cerebral compression should have the scalp shaved.

(35) *Compression within first forty-eight hours* after an head injury must be due to intracranial hæmorrhage and *requires exploratory craniotomy.*

(36) Compression after the first forty-eight hours after an head injury must be due to:
(*a*) Cerebral œdema: dehydration treatment
(*b*) Extradural hæmorrhage:
: Exploratory craniotomy.

(37) Lumbar puncture is highly dangerous in cases of increased intracranial tension and may bring on sudden death due to wedging of the medulla into foramen magnum.
However, in head injuries, where compression is suspected it should be done in head-low position as it helps in diagnosing subarachnoid hæmorrhage, noting its progress and also in deciding the line of treatment.

(38) In subtentorial compression, vital centres are affected early and most, consciousness lasting till the last.

(F) Cerebral sequelæ :

(39) Rest must be enforced on every patient who has had head injury to cause moderate cerebral concussion, the period depending on the nature of work and relapse of symptoms.

(40) Violent exercises and straining should be forbidden for some period (3 months) after a severe head injury to guard against Spät-apoplexie.

(G) Clinical aspects of intracranial trauma :

(41) The factors in the variability of symptoms and signs of head injury are:
(*a*) Severity:
: Transient → mild → moderate → sever

(*b*) Stage:
: Concussion → reaction → irritation
↓ Compression → recovery → sequelæ

(*c*) Site:
(1) Cerebral
(2) Midbrain
(3) Cerebellar
(4) Bulbar.

(*d*) Extent:
(1) Focal
(2) Local
(3) Regional
(4) Unilateral } : Anterior chamber
(5) Bilateral }
(6) Posterior chamber
(7) General

(*e*) Progress:
(1) Incipient: latent
(2) Stationary
(3) Progressive: (α) Slow
(β) Rapid
(4) Retrogressive

(*f*) Time of appearance:
(1) Instantaneous
(2) Immediate
(3) Oncoming
(4) Delayed.

(*g*) Other associated lesions
(*h*) Treatment adopted.

(42) Chief clinical states of the intracranial trauma are:
(*a*) Concussion
↓ (*b*) Reaction
↓ (*c*) Recovery or (*c*) Irritation
↓ (*d*) Compression

(43) { Cerebral irritation: Mind conscious but confused
Cerebral compression: Semi-consciousness
↓ Unconsciousness
↓ Deep coma.

(44) { Concussion: Retrograde amnesia
Contusion:
(*a*) Definite pain worse on straining
(*b*) Slow cerebration
(*c*) Defective memory for recent events
Hæmorrhage: Unequal pupils.

(45) Trotter's sign:
: Intravenous hypertonic saline in coma
↓ Temporary relief of intra-cranial pressure
↓ Diagnosis of the site of its cause.

(46) Chief differential diagnosis between:
- (1) Early compression or cerebral irritation:
  - : Unreasonable automaton:
  - : With purposive action.
- and (2) Alcoholic bout:
  - : Yields to arguments or deviation of attention.

(47) Every case of head injury with compression may have to be differentially diagnosed from alcoholism for which prolonged medical observation is necessary. Always admit such a patient to a surgical hospital.

(H) Treatment of head injury:

(48) *Avoid morphia. Best sedative is a good dose of mag. sulph.*

(49) It is wrong to give an intravenous dehydrating agent to every case of acute brain injury immediately on admission to the hospital. It should be used only when the œdema of the brain, causing rise in intracranial pressure, is present as shown by clinical signs and spinal manometer after forty-eight hours from the time of injury.

(50) Intravenous dextrose causes a reactionary rise in the cerebrospinal fluid pressure, after a fall in it; but has a nutrient value.

(51) Intravenous sucrose does not appear in cerebrospinal fluid and so does not cause a secondary rise in the intracranial pressure but has no nutritional value.

(52) Rebound or return of the cerebral compression in an exaggerated form is far less likely to occur with sucrose than with dextrose, but the former causes general dehydration together with cerebral dehydration.

(53) Indications for operative interference in brain injuries:
- (1) Compression within the first 48 hours
- (2) Recurrence of brain symptoms after recovery from concussion
- (3) Prolonged cerebral irritation
- (4) Progressive compression:
  - (a) Consciousness → Coma
  - (b) Irritation → Paralysis
  - (c) Focal → Regional → Chamber → General
- (5) Inequality of signs on both sides
- (6) Blood pressure and pulse good.

(54) There are two conditions which are definitely improved by operation:
- (a) Depressed local fracture
- (b) Extra-dural hæmorrhage.

(55) Trephine over the suspected lesion:
: If nothing found:
- (a) Enlarge the opening
- ↓ (b) Fresh opening on other likely places
- ↓ (c) Trephine over the contre-coup site.

(56) Before trephining for head injury, decide the following:

(A) Is trephining indicated?

Ind: (1) Slow or medium compression
(2) Depressed or compound fracture

(B) *The side on which to trephine:*

(1) Same side: (a) Local
(b) Blind decompression
(2) Other side: (a) Contre-coup site
(b) Blind decompression

Ind: (1) *Side of advanced pupillary changes*
(2) Opposite to advanced muscular changes

(C) The exact place to trephine

(57) Best time to trephine for intracranial injuries is "reaction or early compression" period.

(58) *Greatest contraindication to trephining is:*
Commencing failure of vital centres, as denoted by *fall in blood pressure.*

(II) INTRACRANIAL SEPSIS:

(A) Sinus thrombosis:

(59) Spreading œdema and malaria-like temperature in a case of local sepsis on the head or face:
? Sinus thrombosis

(60) Preventive treatment of sinus thrombosis:
: Ligature the vein communicating the primary focus with the sinus, before treating the former.

(61) If thrombosis is established, tie the efferent vein before interfering with the affected sinus.

(62) Most common complication of sinus thrombosis is septic embolism, denoted by rigors with high temperature.

(63) Most common etiologies in sinus thrombosis:
1. Lateral sinus: mastoiditis
2. Cavernous sinus: carbuncle upper lip
3. Superior longitudinal sinus: nasal sepsis.

(B) **Abscess of the brain:**

(64) Commonest cause of all abscesses in the cranial cavity, is chronic otorrhœa.

(65) Any intracranial disturbance with a septic focus either near the skull or far away:
? Intracerebral abscess.

(66) Three stages of the development of brain abscess:
(1) Initial stage of local meningo-encephalitis
(2) Quiescent stage of liquefaction & encapsulation:
Syn: Stage of operation
Path: (*a*) Thin-walled: aspirate
(*b*) Thick-walled: drain
Clinic: (1) Subsidence or temperature
(2) Local neurological signs
(3) Leucocytosis > 12000.
(3) Terminal stage of:
(*a*) Recovery
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(67) Slow pulse rate is more suggestive of an abscess than a tumour of the brain.

(68) Severe localised headache is a prominent feature of brain abscess and its presence in the course of extracranial or cranial septic focus should be viewed with suspicion.

(69) Even with the most skilful diagnosis and treatment, the acute fulminating intracranial suppurations cause death and when possible, operation on the brain abscess ought to be deferred until it has become encapsulated.

(70) In brain abscess, rub the exposed surface and cut edge of the cranium and its coverings with BIPP after trephining and before evacuation of the pus.

(71) In intracranial abscess secondary to otitis, open the mastoid and the middle ear and then follow the route of infection as seen by morbid changes.

(72) An encapsuled abscess rises towards the surface if a decompression is made directly over it.

(73) In brain abscess, it is better to wait till a capsule has formed around it, provided the patient's condition will allow temporisation.

(C) **Miscellaneous:**

(74) Condition of the patient in:
(A) Septic meningitis: anxious and irritable
(B) Sinus thrombosis: bright and animated
(C) Brain abscess: dull or stuporous

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(75) Analogy between:
- (*a*) Hernia cerebri
- (*b*) Hernia testis

is that both are due to sepsis, are protrusions from the cavity in which they normally lie and are not covered by their special membranes and so are not hernias in the real sense of the term.

(III) INTRACRANIAL NEW GROWTHS:

(76) A tumour disturbs the workings of the brain as a whole, because of the interference with intracranial circulation.

(77) Methods of investigation in intracranial tumours:
- (1) Analysis of symptoms
- (2) Neurological examination
- (3) Visual fields and the retinæ
- (4) [illegible]
- (5) [illegible]
- (6) [illegible]
- (7) Exploratory craniotomy

(78) Clinical features of intracranial tumours depend on:
- (1) Situation: of the tumour
  - (*a*) Posterior fossa:
    - (α) Early rise in intracranial tension
    - (β) Early affection of vital centres
    - (γ) Late mental symptoms
  - (*b*) Anterior fossa:
    - (α) Focal signs
    - ↓ (β) General tension signs
    - ↓ (γ) Late affection of vital centres
    - (δ) Early mental symptoms
- (2) Nature: of the tumour

(79) The only early manifestations of an intracranial tumour may be epileptic seizures.

(80) Epileptic attacks for the first time in a person of middle age: ? Frontal tumour.

(81) In childhood and young adult life, *any progressive derangement of the functions of central nervous system* should lead to the suspicion of an intracranial tumour.

(82) A steady progressive focal irritation or paralysis is the only true sign of an intracranial neoplasm.

(83) Bilateral, intermittent headache accompanied by any palsy: ? Intracranial tumour.

Every case of 'migraine' should be thoroughly examined. In recurrent headaches, examine:

(a) The fundi
(b) Visual field
(c) X-Ray skull.

(84) Disordered metabolism (pituitary dys
be an earliest sign of an intracranial tumour.

(85) In children, prominent intracranial tumour signs are:
(1) Vomiting
(2) Stiff neck
(3) Separation of sutures
(4) Papillœdema.

(86) Symptoms and signs of slow rise in general intracranial tension or cerebral tumour syndrome:
(a) Slow cerebration
(b) Headache
(c) Vomiting
(d) Slow pulse
(e) Subnormal temperature
} Even these are comparatively late signs.
(f) **Optic neuritis**

(87) Meningiomas are amongst the most important of intracranial tumours, because they are curable. They indent the nerve tissue but do not invade it though invasion of the overlying cranium may be free. The main clinical signs are due to general rise in intracranial pressure unless the growth is situated over the active area.

(88) Painless, very slowly increasing, apparently unimportant swelling in the skull may be the only outward sign of an intracranial meningioma.

(89) Chief signs of meningiomata:
(1) Epilepsy: (a) Motor
(b) Sensory
(2) Focal signs
(3) Signs of rise in general intracranial tension
(4) Bone hyperostosis.

(90) Gliomata: 40% of all intracranial tumours
(a) Astrocytoma : benign cyst
radically removable
not radio-sensitive
(b) Glioblastoma: adults
locally malignant
radio-sensitive
decompression & irradiation
(c) Medulloblastoma: children
malignant + +;
rapid dissemination
radio-sensitive
decompression & irradiatioı

(91) Characteristic groups of intracranial tumours:
- (A) Pituitary syndrome:
  - (a) Visual signs
  - (b) X-Ray changes
  - (c) Endocrine disturbance
- (B) Acoustic syndrome:
  - (a) Unilateral deafness
  - (b) Disturbed equilibrium
  - (c) Pressure signs.

(92) Cerebellar tumours of 4th ventricle:
- (1) Medulloblastoma
- (2) Ependymoma
- (3) Astrocytoma
  - (a) It is rare to have a tumour in the posterior fossa between 40 and 60 except auditory neuro-fibroma
  - (b) Vast majority of patients with cerebellar tumour are below 40
  - (c) Prominent symptoms are:
    - (α) Headache
    - (β) Vomiting
    - (γ) Papillœdema
    - (δ) Nystagmus } absent in 25% of
    - (ε) Ataxia } cases.

(93) Unexplained vomiting in children: ? cerebellar medulloblastoma.

(94) A child who complains of headache before breakfast and vomits: ? cerebellar medulloblastoma.

(95) Cerebral vomiting + neck spasm in the absence of meningitis, are indications of subtentorial tumours.

(96) Intracranial tumours in childhood:
- (1) Cerebral tuberculoma
- (2) Congenital hypophysial tumour
- (3) Cerebellar medulloblastoma

(97) The most common age incidence in intracranial tumours:
- (1) *Children and young adults: (See above)*
- (2) Between 40 and 60:
  : Secondary malignant tumour

(98) Bronchus is the commonest primary focus of a secondary metastatic tumour of the brain. Malignant melanoma is also a common primary focus.

(99) Aneurysm is the commonest cause of isolated third nerve palsy.

(100) Monocular blindness: Meningioma close to optic foramen

(101) Patients coming to the neuro-surgeon for blindness, generally have:
- (a) Pituitary tumour
- (b) Acoustic neuroma
- (c) Cerebellar astrocytoma
- (d) Anterior basal meningioma

(102) Ventriculography or encephalography may produce acute symptoms and should not be done if they can not be followed by decompression operation if necessary.

(103) If 25 c.cs. of cerebrospinal fluid can be drawn from one ventricle, there is no tumour in that hemisphere.

(104) Asymmetry of lateral ventricles is a strong evidence of a cerebral tumour on the side of the smaller ventricle.

(105) Diagnosis of an intracranial tumour is only made by the constant realisation of its possibility and knowledge of common typical syndrome.

(106) Tumours of the skull must always be taken seriously, however small and insignificant they may be.

(107) Posterior fossa lesions apart from malignant medulloblastoma of childhood are much more favourable than any hemispherical tumour.

(108) Most fatal intracranial tumours are:
- (1) Tuberculomata: 29%
- (2) Metastatic tumours: 21%
- (3) Gliomata: 19·5%.

(109) Tumours most amenable to surgical removal:
- (a) Meningioma
- (b) Pituitary adenoma
- (c) Suprasellar craniopharyngioma
- (d) Acoustic neuro-fibroma

(110) It is wiser to open the skull in doubtful cases and run the risk of unnecessary operation than run the risk of allowing a patient to be blind from optic atrophy.

(111) From surgical treatment point of view, brain tumours can be divided into following groups:
- (A) Encapsuled or infiltrating
- (B) Accessible or inaccessible:
  - (1) Encapsuled accessibles:
    - (a) Meningiomata
    - (b) Acoustic neuro-fibromata
  - (2) Infiltrating accessibles:
    - : Gliomata.

(112) Two most common tumours which are met with the hemispheres are:

(*a*) Meningiomata
(*b*) Gliomata.

(113) Treatment of cerebral tumours:
(A) Radical: (*a*) Innocent cortical tumours
(*b*) Acoustic tumour
(*c*) Cysts
(B) Palliative:
: Malignant, infiltrating or inaccessible tumours with:
(*a*) Persistent headache
(*b*) Failing eyesight
(*c*) Epileptic fits
(*d*) Vomiting
(*e*) Insomnia.

(114) No form of radiotherapy should be given through an intact skull as it raises the intracranial tension due to œdema of the brain, which may be fatal.

(115) Preliminary decompression is essential in:
(1) Irradiation of intracranial tumours
(2) Antisyphilitic treatment in syphiloma.

IV) TREPHINING:

(116) Craniotomy: Osteoplastic opening of the skull with replacement of the bone.
Craniectomy: Removal of bone from cranium.

(117) Site of choice in palliative decompression:
(A) Local: directly over the lesion
(B) If no localisation:
(*a*) Subtemporal: (α) Unilateral
(β) Bilateral
Ind: Anterior chamber tension
(*b*) Suboccipital:
Ind: Posterior chamber tension

(118) Supratentorial tumours are exposed through osteoplastic flap craniotomies, while infratentorial tumours are *explored through suboccipital* craniectomies.

(119) Direct craniectomy with dural opening should never be done:
(*a*) Over the site of a cerebral tumour
(*b*) Over the motor cortex:
: Unless the cause is removable. In both these cases, decompression can be effected by extensive bone removal without dural opening.

(120) The flap of the scalp should always be bigger than the bone flap; as far as possible no defect in the

scalp should overlie a defect in the skull, to avoid: (*a*) Intracranial infection
(*b*) Open hernia cerebri.

(121) In trephining:
(*a*) Keep the pin on sound bone
(*b*) Do not forget to remove the pin after settling
(*c*) Test the depth every now and then on all sides
(*d*) Separate the dura before nibbling.

(122) If after trephining, the dural condition shows very high intracranial pressure, tap the ventricles before opening the dura.

(123) Do not suture the dura mater after cerebellar operations.

(124) Hæmorrhage during trephine operation:
(*a*) Special clamp
(*b*) Muscle or postage graft
(*c*) Plugging.

(125) For any hæmorrhage, press on a piece of living muscle to the bleeding surface for a minute or two.

(126) There are no sensations deep to the pericranium.

(127) Uncontrollable pain persisting after 24 hours after operation on the cranium is suggestive of internal hæmorrhage.

EPILEPSY:

(128) Idiopathic epilepsy rarely starts in adult life.

(129) Epileptic attacks starting for the first time in adult life:
? (1) General paralysis of the insane
? (2) Intracranial tumour
? (3) Cerebral abscess, adhesions, fibrosis

ACOUSTIC TUMOUR:

(130) In acoustic neuro-fibroma, look for other signs of generalised neuro-fibromatosis.

(131) Symptoms in cerebello-pontine acoustic tumour:
(1) Headache
(2) **Deafness**
(3) Blindness: (*a*) Choked disc
↓ (*b*) Optic atrophy
(4) Vomiting
(5) Fits
(6) Psychic changes
(7) **Facial:** (*a*) Spasms
(*b*) Paresis
(8) **Pyramidal signs**
(9) **Trigeminal anæsthesia**
(10) **Cerebellar signs**
(11) Dysarthria
(12) Dysphagia

CHAPTER II

THE SPINE AND SPINAL CORD

I ANATOMY:

(A) Sensory localisation in the spinal cord:

Segment	*Area*	
C. 1, 2, 3	: Scalp	
C. 2, 3, 4, 5	: Neck and upper part of the chest	
C. 4, 5	: Shoulder	
C. 5, 6	: Arm	: outer side
C. 6, 7	: Forearm hand-thumb	: radial side
C 7, 8, D. 1	: Arm	: inner side
	Forearm-hand	: unlnar side
	Finger tips	
D. 1-9	: Front of the thorax	
D. 6-7	: Ensiform area	
D. 7-L. 1	: Abdomen	
D. 10, 11	: Umbilicus	
D. 12, L. 1	: Buttock	: upper part
L. 1, 2	: Groin and scrotum	
L. 2, 3, 4, 5	: Thigh	: (*a*) outer side
		(*b*) front
		(*c*) inner side
L. 5, S. 1, 2, 3	: Buttock	: lower part
	Thigh	: back side
	Leg	: inner side
	Leg and foot	: except inner side
S. 3, 4, 5	: Perineum and anus	
Coccygeal	: Skin from coccyx to anus	

(A1) Levels on the trunk of sensory nerve distribution:

(*a*) Suprasternal notch	: 3 & 4 C.
(*b*) Nipples	: 4 D.
(*c*) Ensiform cartilage:	: 7 D
(*d*) Umbilicus	: 10 D.
(*e*) Ant. sup. iliac spine	: 12 D.
(*f*) Scrotum	: 1 & 2 L.
(*g*) Perineum and anus	: 3, 4, 5 S.

(B) Motor distribution for individual segments:

Segment	*Important muscles supplied.*	
C. 1	: Small flexors of the head	
	Depressors of the hyoid	
C. 2	: Sternomastoid	: rotator and flexor of the head
	Small rotators of the head	

Segment	*Muscles*	*Actions*
C. 3	: Levator scapuli	: elevator of upper scapular angle
	Scaleni	: lateral flexors of the neck
	Trapezius	: (*a*) extensor and deviator of head (*b*) rotator of scapula
C. 4	: Diaphragm	: respiration and coughing
C. 5	: Deltoid	: flexor, extensor & abductor of arm
	Spinati	: abductor and evertor of arm
	Teres minor	: abductor and evertor of arm
	Rhomboids	: retractors and elevators of scapula
C. 6	: Biceps	: flexor and supinator of forearm
	Coraco-brachialis	: flexor and adductor of arm
	Brachialis anticus	. flexor of the forearm
	Supinator longus	. flexor and supinator of forearm
C. 7	: Triceps	: extensor of forearm and arm
	Extensors of wrist and fingers	
C. 8	: Flexors of wrist and long flexors of fingers	
D. 1	: Muscles of thenar and hypothenar eminences	
	Interossei	: abductors and adductors of fingers
	Lumbricales	: flexors and extensors of fingers
	Oculo-pupillary fibres	
D. 2–12	: Intercostals	: respiration
D. 7–12	: Abdominal wall	: respiration, compression of viscera
L. 1, 2	: Iliopsoas	: flexor and evertor of the thigh
	Quad. lumb.	. deviator of chest
L. 3	: Quadriceps ext.	: extensor of the leg
L. 4	: Adductors femoris	: adductors of the thigh
L. 5	: Tibialis anticus	: plantar flexor and invertor of foot
	Ext. digit. long.	: extensor of toes
	Extensor hallucis	: extensor of great toe
S. 1	: Gastrocnemius	· plantar-flexor of the foot; flexor of the leg
	Hamstrings	: flexors of the leg
	Long flexors of the toes	
S. 2	: Glutei	: extensor, abductor and evertor of the thigh
	Intrinsic muscles of the foot	
S. 3, 4, 5	: Perineal musculature of :	(*a*) defæcation (*b*) micturition

(C) Localisation of reflex centres in the spinal cord:

C. 5, 6	: Scapulo-humeral reflex	
C. 5, 6, 7	: Elbow and wrist jerk	
D. 4-7	: Epigastric	: upper abdominal reflex

D. 8-L. 1 : Lower abdominal reflex
L. 1, 2, 3 : Cremasteric reflex
L. 2, 3, 4 : Knee jerk
L. 4, 5, S. 1 : Gluteal reflex
L. 5, S. 1 : Tendo Achilles jerk; ankle clonus
S. 1, 2, 3 : Plantar reflex

(D) **Cauda equina**: contains
- (1) Motor and sensory fibres to:
  - (*a*) Lower limbs
  - (*b*) Perineum
  - (*c*) External genitalia
- (2) Bladder and rectum

(E) **Superficial relations of the spine and spinal cord:**
- (*a*) (1) Uppermost spine to form visible projection is 7C.
  - (2) Twelfth rib is a useful guide to 12D.
  - (3) **Intercrestal line passes between 3rd and 4th lumbar spines**
- (*b*) **The cord ends below at the level of the space between the 12th dorsal and 1st lumbar spines**
- (*c*) Intra-spinal course increases regularly for the cervical and thoracic nerves

	Region	*Level of exit*
(1)	Upper cervical	depth of one vertebra
(2)	Lower cervical	opposite second spine above (6C. nerve opposite 4C. spine)
(3)	Upper dorsal	opposite third spine above (5D. nerve opposite 3D. spine)
(4)	Lower dorsal	opposite fourth spine above (9D. nerve opposite 6D. spine)
(5)	All lumbar	opposite 10D. and 11D. spines
(6)	All sacral	opposite 12D. spine between 12D. and 1L. spines

- (*d*) At the 8th cervical nerve, the relation of the nerves to denominating vertebræ changes:
  - (1) Above 8C: nerve issues above corresponding vertebra
  - (2) Below 8C: nerve issues below corresponding vertebra
- (*e*) **The theca extends down to 2 S. Vertebra**

(II) CONGENITAL ABNORMALITIES:

(1) SPINA BIFIDA: Rachischisis

Def: Failure of fusion of vertebral arches, associated with maldevelopment of spinal cord and membranes

D. 8-L. 1	: Lower abdominal reflex
L. 1, 2, 3	: Cremasteric reflex
L. 2, 3, 4	: Knee jerk
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(II) CONGENITAL ABNORMALITIES:

(1) SPINA BIFIDA: Rachischisis

Def: **Failure of fusion of vertebral arches,** associated with maldevelopment of spinal cord and membranes

Etio: Site: **Lumbodorsal**
Cervical
Lumbosacral
Incidence: 1 in 900 births

Path: Varieties: **Keiller's classes:** (Med. Ann. 1931)

(1) **Primary mesoblastic error:**
: Rachischisis incompleta restricta:
(*a*) Spina bifida occulta
(*b*) Meningocele

(2) **Primary mesoblastic + Secondary ectodermal error:**
(*a*) Myelo-meningocele
(*b*) Hydro or syringo-myelo-meningocele

(3) **Primary ectodermal + Secondary mesoblastic error:**
: Myelocele: restricta-partialis-totalis

Theories: (*a*) Failure of the **medullary groove** to close
(*b*) Failure of the **mesoblast** to unite in the midline, separating the spinal cord from the skin

Varieties:

(A) **Spina bifida:** *Laminar defect*

(1) **Spina bifida occulta:**
: Failure of neural arches to unite, unassociated with any protrusion of the membranes or cord, the defect sometimes being protected by some tumour or a tuft of hair over it

(2) **Meningocele:**
: Protrusion of meninges with cerebrospinal fluid, through a spino-laminar defect, with spinal cord in its normal position

(3) **Myelo-meningocele:**
: Meningo-myelocele
: Spinal cord or cauda equina courses through the meningeal herniation through the laminar gap

(4) **Hydro-myelo-meningocele:**
: Syringo-myelocele
: Dilatation of central canal of the cord, which lies in the meningeal herniation through the laminar gap

(B) **Rachischisis:** *Unclosed neural furrow*
: Failure of the closure of neural furrow, due to arrest of development

(1) **Complete:** Myelocele totalis
: Whole unclosed cord exposed on skin surface

(2) **Partial:** Myelocele partialis
: Cord exposed on the skin surface in:
(a) Thoracico-lumbar region
(b) Lumbo-sacral region

(3) **Open myelo-meningocele:**
: Myelocele restricta
: Cord exposed on the skin surface, raised on a cystic swelling containing cerebro-spinal fluid

(C) **Anterior rachischisis or spina bifida:**
: Anterior defect in the vertebral bodies, associated with p r o t r u s i o n o f t h e membranes or cord anteriorly

Clinic:

(1) **Local examination:**

(A) Spina bifida occulta: *most common*
(a) *Abnormal overlying skin*
(b) Overlying lipoma
(c) Nothing abnormal clinically

(B) Meningocele
Myelo-meningocele
Hydro-myelo-meningocele }
: **Cystic translucent swelling in the midline over the spinal column,** with or without opaque areas
(a) Communicating: reducible
: impulsive
(b) Non-communicating: non-reducible
: non-impulsive

(C) Myelocele: *incidence next to (A)*
(a) Area medullo-vasculosa
(b) Zona epithelio-serosa
(c) Central canal opening
Extent: (α) Whole: totalis
(β) Regional: partialis
(γ) Local: restricta

(D) Open myelo-meningocele:
: Myelocele protruding over the surface of an underlying meningeal cystic swelling

(2) **Nervous disturbances:**
: Due to implication of the spinal cord itself, by
(a) Involvement
(b) Pressure
(c) Traction

Signs: (1) Paralysis with **deformities: lower limb**
(2) Paralysis of **sphincters: bladder**
(3) **Trophic** changes: perforating ulcers

(3) **Associated congenital abnormalities:**
(1) Talipes
(2) Abnormalities of external genitalia
(3) Abnormalities of face
(4) Hydrocephalus:
(α) Pre-operative
(β) Secondary: post-operative

(4) **Special signs:**
(*a*) **Transillumination:** In
(α) Meningocele
(β) Myelo-meningocele } : opaque areas
(γ) Syringo-myelocele }
(*b*) **X-Rays:**
(α) Ordinary
(β) After replacement of fluid by oxygen
(1) Antero-posterior
(2) Lateral

Compl: (1) Incompatibility with life: complete myelocele
(2) Rapid increase in **size**
(3) Dermatitis or **ulceration**
↓ (4) Rupture
↓ (5) Infection → **meningitis**
(6) **Paralysis:**
(*a*) From birth
(*b*) 9th to 17th year:
: Due to traction by membrana reuniens in spina bifida occulta
(7) **Hydrocephalus**
(8) Associated congenital deformities
(9) Paralytic deformities: **talipes**

Treat:
(1) Conservative: **Protection by celluloid cup**
Ind: (*a*) Rachischisis
(*b*) Upto five years of age
(*c*) Too severe complications
(2) **Operative:**
Ind: (*a*) Meningocele
(*b*) Spina bifida occulta with symptoms
(*c*) Advent of complications
Age: (*a*) Myelocele: 3–7 days after birth
(*b*) Meningocele:
(α) Early: within 4 weeks of birth
(β) Late: after 2–5 years
(γ) Immediate:
: Advent of complications

(A) Excision and repair:
Tech: (a) Elliptical incisions
↓ (b) Ligature of pedicle
or (b) Open the sac
↓ (c) Return the contents
↓ (d) Superimposition of flaps
↓ (e) Superimposition of lumbar fascia
(B) Drainage into the tissues:
: Into peritoneal cavity by silk threads
(C) Excision of membrana reuniens:
Ind: Late onset of paralysis in spina bifida occulta

Post. treat: Nursing in prone reversed position
: Urotropine, sulphonamides

Post. compl: (1) Cerebrospinal fluid **leakage:**
: Reversed position
(2) **Infective meningitis:** Urotropine, asepsis
(3) **Convulsions:** Dehydration treatment
(4) Paraplegia
(5) **Hydrocephalus:** Preserve the sac

(2) SACRO-COCCYGEAL ABNORMALITIES:

Path: (1) *Anomalous development in early embryo:*
(A) **Parasites**
(B) **Sacro-coccygeal teratoma:** Mixed
(a) Solid
(b) Cystic
(2) *Persistence of rudimentary structures:*
(A) **Neurenteric canal remnant:**
: Ventral to sacrum and coccyx
(B) **Post anal:** (a) Cyst
(b) Sinus
(c) Fistula
Origin: Filum terminale extremity
Site: Tip of the coccyx, behind the anus
(3) *Inclusion dermoids*
(4) *Chordoma*

Clinical varieties:
(A) *Posterior lesions:*
: **Sacro-coccygeal or pilonidal cyst or sinus:**
Etio: Congenital malformation
Path: (a) Faulty coalescence of skin:
: Sequestration dermoid
(b) Lack of closure of neurenteric canal
Clinic: (a) Tender swelling
or (b) Single or multiple **openings**

(α) **Lined by skin**
and (β) Discharging: (1) serous fluid
or (2) pus
or (3) hair

Site: (*a*) **Midline**
(*b*) **Over the lower sacrum**
(*c*) Between the buttock folds

Diff. diag: **Fistula-in-ano. or bone necrosis**

Compl: Recurrent inflammations

Treat: (1) Excision and drainage
(2) Excision and packing
(3) Excision and primary suture

Contraind: Acute inflammation
Anæsth: Local
Tech: Complete removal
: Obliteration of dead spaces
. Copious dressings
: Adhesive strapping
: Sutures out on 4th day
Post. compl: Infection

(B) *Anterior lesions:*

(1) **Dermoids:**
(*a*) Perineal
(*b*) Proctodeal
(*c*) Neurenteric
(*d*) Post-anal.

(2) **Meningeal cyst:** Meningocele

(3) **Teratomata**

Diff. diag: Intrapelvic growths: uterus, ovaries

(C) *Anterior or posterior lesion:*

: **Chordoma:** Tumour of the noto-chord

(1) **Spheno-occipital:**
Age: 30–40
Tumour involving: spheno-occiput
: nasopharynx
: orbit
: air sinuses

(2) **Sacro-coccygeal:**
Site: In front of or behind the sacrum
Clinic: Slow, large, infiltrating
Treat: Local removal

(3) CERVICAL RIB: (See under Nerves)

(III) TRAUMA:

(A) SPINAL SPRAIN:

Path: (*a*) Ligaments
(*b*) Muscles

Clinic: (*a*) Localised pain: on particular movement stretching the sprained structure
(*b*) Localised tenderness
(*c*) Localised spasm
(*d*) Localised bogginess
(*e*) X-Ray: negative
Treat: (*a*) Rest in bed → massage and movements
(*b*) Leriche's novocain treatment

(B) SPINAL DISLOCATION:

Site: Cervical region
Path: (1) **Unilateral dislocation:**
Morb. anat: Lower process of upper vertebra
— displaced anteriorly over —
Upper process of lower vertebra
Clinic [illegible]

(2) [illegible]
Clinic [illegible]

(3)
Morb. anat: Upper vertebra
— displaced anteriorly over—
Lower vertebra
Clinic: Head displaced forward
Clinic: (1) Deformity:
(*a*) Inspection
(*b*) *Pharyngeal palpation*
(2) Spasm and immobility
(3) Root pains
(4) Cord signs:
(*a*) Between occiput and atlas:
Clinic: instantaneous death
(*b*) **Between atlas and axis:**
Etio: (α) **Hanging**
(β) Ear-lift
Clinic. Death due to shock and respiratory paralysis
(*c*) **Between C. 5 and C. 6:**
Etio: (α) **Diving**
(β) Falls on the head
(γ) Wrestling
Compl: **Cord involvement** with all its sequelæ
Treat: (A) **Conservative:** Closed reduction
Tech: (*a*) **Anæsthesia:** Local
(*b*) **Reduction:** Traction + counter-traction
(α) Unilateral:
: Lateral flexion to opposite side
(β) Bilateral: extension

(c) **Immobilisation:**
By: Plaster-of-Paris
Extent: Pelvis → vertex → eyebrows

(B) **Operative:** Open reduction
Ind: Failure of closed reduction
Tech: (a) Exposure
(b) Reduction after:
(α) Manipulations
or (β) Excision of processes

(C) SPINAL FRACTURE:

(1) **Compression fracture of the vertebral body:**
Site: 12 D.; 1 L.
Cause: Flexion + compression: falls from height
Clinic: (a) All local signs of fracture. (See page 810)
(b) No spinal cord involvement
(c) X-Ray: (α) Antero-posterior
(β) **Lateral**
(γ) In flexion
(δ) Delayed
Diff. diag: (1) **Spinal sprain**
(2) Scheuermann's disease
(3) Congenital wedge vertebra
(4) Pathological fracture
Sequelæ: (a) **Kummell's disease**
(b) **Deformity**

(2) **Fracture of the laminæ**
(3) **Fracture of spinous processes**
(4) **Fracture of transverse processes** } :
Etio: Direct injury
Clinic: (a) **Local signs** of trauma
(b) Crepitus: may be present
(c) X-Ray
Compl: (a) **Injury to ureters:**
: In fracture of the transverse process
(b) Injury to the cord: in fracture of the laminæ
Treat: (1) Slight cases:
: Strapping and bandaging for 3 weeks
(2) Avulsions:
(A) Immobilisation:
By: **Plaster jacket**
Extent: Lower pelvis to nipple
For: 6 to 8 weeks
↓ (B) Spinal exercises: from 3rd week
↓ (C) Resumption of work: after 12–24 weeks
Sequelæ: (1) Fibrous repair
(2) Adhesions
(3) Chronic persistent backache

(D) FRACTURE-DISLOCATION :

Varieties : (1) Compression fracture (C) : with displacement
(2) Oblique fracture of the body :
: *With displacement*

Cause : Indirect trauma : fall from height

Site : (*a*) **Cervico-dorsal**
(*b*) **Dorsi-lumbar**

Path : (*a*) **Fracture :**
: *With anterior and downward displacement* of upper fragment
(*b*) **Cord injury :**
: By upper and post. edge of lower frag.

Clinic : (1) **Deformity** : Angular
(2) Pain : local and referred
(3) Tenderness
(4) Spasm
(5) **Spinal involvement** : Due to
(*a*) Concussion
(*b*) Contusion and laceration
(*c*) Transection
(*d*) Compression
(6) X-Ray : (*a*) Antero-posterior
(*b*) **Lateral**

Clinical types : (A) Fracture-dislocation :
: **Without paraplegia**
(B) Fracture-dislocation :
: **With paraplegia**
(C) Fracture-dislocotion ;
: **With threatened paraplegia :**

Cause : **Dislocation of intact articular** process of the upper vertebra over the lower one

Diag : (*a*) Lateral X-Ray
(*b*) **Paraplegia worse on hyper-extension**

Treat : **Excision of the art. processes :**
: Under local anæsthesia

Compl : **Cord involvement** : With all its sequelæ

(E) INJURY TO INTERVERTEBRAL DISC :

Etio : (1) Falls from height
(2) Flexion strains : heavy lifting
(3) Manipulations of the spine
(4) *Lumbar punctures*

Sex : Men between 20 and 50

Site : (*a*) Disc between L 4 and L 5
(*b*) Disc between L 5 and S 1

Path. varieties : (1) **Rupture :**
(*a*) *Pure*

(*b*) Associated with fracture vertebra

(2) **Retropulsion of nucleus pulposus :**

: Through posterior common ligament into :

(*a*) Spinal canal → cord pressure

(*b*) Intervertebral foramen → root pressure

(c) Vertebral body → bony ankylosis

: (Scheuermann)

(3) **Fibrosis and hypertrophy of lig. flava**

Clinic : (1) History of trauma → sciatica

(2) **Sciatic scoliosis**

(3) **Pressure signs :**

(*a*) Root signs : root pains—sciatica

(*b*) Cord signs : paralysed limb and sphinct.

(α) spastic

↓ (β) flaccid

(4) **Bony ankylosis :**

: In cases of prolapse into the vertebral body

(5) Neurological : **Spinal block**

(*a*) Fluid normal or protein +

(*b*) Queckenstedt positive

(6) **X-Rays :**

(*a*) Routine plain :

: **Diminution of inter-vertebral space**

(*b*) Air myelography

(c) **Lipoidol** myelography :

Tech : 5 c.c. of lipoidol between L 3 & L 4

↓ X-Ray in prone position

↓ Filling defect

Diff. diag : (1) **Sciatica**

(2) Back strain

(3) Spondylitis

(4) **Spinal cord tumours**

Treat : (1) **Plaster** or celluloid jacket

(2) Operative : **Laminectomy**

(A) Excision of protruding cartilage

(*a*) Extradural

(*b*) Intradural

(B) Dissection of ligamenta flava

(F). SPINAL CORD INJURIES :

Etio : (1) Lumbar fracture-dislocations

(2) Dorsal fracture-dislocations

(3) Cervical dislocations

Path : (1) **Extension quadriplegia :**

: Immediate and short-lived paralysis after sudden hyperextension of the spine

(2) **Spinal concussion :**

: Immediate paraplegia below the segment, with spontaneous recovery, accompanying every well-marked fracture spine

(3) **Organic lesions of the cord:**

(A) *Immediate:*

(1) **Contusion**

(2) **Laceration**

(3) **Transection**

(4) **Hæmorrhage:**

(*a*) **Extrathecal**

(*b*) **Intrathecal**

(*c*) **Intramedullary**

(*d*) **Ingravescent:** Thorburn

: Gravitational paraplegia

(B) *Delayed:*

(1) **Softening:** Myelitis

(2) **Sepsis:** Meningitis

(3) **Meningitis serosa circumscripta**

Clinical varieties of spinal cord lesions:

(1) **Spinal shock or concussion:**

(A) **Sensory:** Anæsthesia

(B) **Motor:**

(*a*) **Immediate onset**

(*b*) **Bilateral** flaccid paralysis:

: Below the affected segment

(*c*) **Spontaneous recovery:** Within three weeks

(C) **Reflexes:**

: Complete **disappearance** of all superficial and deep reflexes: below the level

(D) **Visceral:**

(*a*) **Bladder** incontinence or retention

(*b*) **Anal** incontinence or retention

(2) **Spinal compression:**

Causes: (*a*) Œdema

(*b*) Bone or foreign body

(*c*) Hæmorrhage

(*d*) Inflammation

(*e*) Adhesions

(*f*) Cystic meningitis

Path: Signs depend on:

(*a*) Extent of cord interruption

(*b*) Site of cord compression

Clinic: (*a*) Irritation: above the level

(*b*) Lower neuron paralysis: at the level

(*c*) Upper neuron paralysis: below the level

Treat: (1) Reduction of deformity

↓ Fixation in hyperextension

(2) **Operative treatment:** Laminectomy
Ind: (*a*) Incomplete lesions
(*b*) Within two months

(3) **Spinal hæmorrhage:**
(A) **Extradural:**
(1) **Thorburn's gravitation paraplegia:**
: Progressively ascending:
(*a*) Irritation
↓ (*b*) Paraplegia
(2) Root pains
(B) **Intradural: Blood in c. s. f.**
(C) **Intramedullary:**
(1) Flaccid paralysis
(2) Absence of pain and irritation
(3) Dissociation of sensations
(4) Limited extent of the lesion

(4) **Spinal destruction:**
(A) **Complete transection of the cord:**
: Presence, after three weeks, of following signs:
(1) **Sensory:**
(*a*) Hyperæsthesia: of the segment above
Complete: { (*b*) Anæsthesia: of the segment affected
(c) Anæsthesia: of the segments below
(2) **Motor:**
(*a*) Spastic muscles: of the segment above
(*b*) Flaccid paralysis: of the segment affected
(*c*) Spastic paralysis: of the segments below
(3) **Attitude: Paraplegia in flexion:**
(*a*) Flexion-adduction of hips
(*b*) Flexion of knees
(4) **Reflexes:** Development of **mass reflex:**
: Stimulation of the sole:
↓ Flexor spasms of lower limb
+ Automatic emptying of bladder
(5) **Visceral:**
(*a*) Bladder: (α) Retention
↓ (β) **Automatic bladder**
(*b*) Rectum: constipation
(6) **Trophic:** Bed-sores

Stages of complete cord lesion:
(1) **Stage of complete inhibition** and flaccid paralysis
↓ (2) **Three weeks**
↓ (3) **Stage of reflex establishment:**
(*a*) Spastic paraplegia in flexion
(*b*) Mass reflex
(*c*) Reflex or automatic bladder

(B) **Incomplete transection of the Cord:**
: Signs as in complete transection, except:
(a) Incomplete nature of signs
(b) **Paraplegia in extension**
(c) Absence of mass reflex

Special signs of cord injuries at different levels:

(A) **Cervical segments:**
: General: (α) Wide paralysis
(β) Absence of unconsciousness
(γ) Contracted pupils
(δ) *Wide variations of temp.*

(1) Above C 5
(a) Paralysis of all respiratory muscles
(b) Complete quadriplegia

(2) C 5. Complete flaccid paralysis of all arm muscles

(3) C 6: (a) Arms: **abduction** + eversion
(b) Forearms: flexion + **supination**

(4) C 7: (a) Arms: flexion + **adduction**
(b) Forearms: flexion + **pronation**
: (Forearms on chest)

(5) C 8: D 1:
(a) **Flaccid paralysis of:**
(α) Flexors of wrist and fingers
(β) ***Intrinsic muscles of the hand***
(b) **Spastic paralysis of:**
(α) Intercostals
(β) Abdominal muscles
(γ) **Lower limbs**

(B) **Dorsal segments:**
(1) D 1: (See above)
(2) D 2. (a) **Contracted pupils**
(b) Hyperæsthesia along inner arm
(3) D 3–12.
(a) *Girdle hyperæsthesia*
(b) **Weak forced expiration and cough**
(c) Spastic paraplegia

(C) **Lumbar enlargement:**
(a) **Active urinary incontinence**
(b) **Active fæcal incontinence:**
. With patulous anus.

(D) **Cauda equina:**
Path: **Behaves as posterior nerve roots:**
(α) Severe and persistent **pain**
(β) **Spontaneous recovery**
(γ) **Delayed automaticity of bladder**

Clinic: (a) Anæsthesia of lower limbs & perineum
(b) **Flaccid paralysis of lower limbs & perineum**
(c) Abolition of lower reflexes:
(α) Plantar
(β) Cremasteric
(γ) Anal
(δ) Bulbo-cavernosus
(d) Paralysis of:
(α) Bladder: with retention
(β) Rectum: with constipation
(γ) Genitals

(E) **Sacral roots:**
(a) **Saddle anæsthesia**
(b) Flaccid paralysis of posterior lower limb muscles
(c) Paralysis of bladder, rectum & genitals

Complications of fracture spine:

(A) FRACTURE ITSELF:
(1) **Malunion:** Deformity
(2) Intervertebral **disc injury:** Ankylosis
(3) **Kummell's** disease. Traumatic osteoporosis
(4) **Osteoarthritis**
(5) Spinal **neurasthenia:** Railway spine
(6) Aggravation of pre-existing disease
(7) Tuberculosis of spine·

(B) CORD INVOLVEMENT:
(a) Immediate: **Concussion**
(b) Intermediate: (1) **Destruction**
(2) **Compression**
(3) Inflammation:
(α) Meningitis
(β) Myelitis
(c) Delayed : (1) Fibrosis and adhesions
(2) Meningitis serosa circumscripta

(C) OTHER SYSTEMS:
(1) **Lungs:** Pneumonia
(2) **Bladder:**
Path: Factors: (a) **Loss of motor innervation**
↓ (b) Poor emptying
↓ (c) Stagnation of urine
↓ (d) Atony + infection

Path. anat: (a) **2nd and 3rd lumbar:** Sympathetic
Functions: (a) Detrusor inhibition
(b) Sphincter stimulation
Clinic: Paralysis
↓ **Active incontinence**
(b) **2nd and 3rd sacral:** Parasympathetic

Functions: (*a*) Detrusor stimulation
(*b*) Sphincter inhibition
Clinic: Paralysis
↓ **Retention**

Causes of infection:
(*a*) Frequent catheterisation
(*b*) Auto-infection

Clinical groups: (1) **Retention**
(2) **Incontinence:**
(*a*) **Active:** 2, 3 L.
(*b*) **Passive:** (Overflow) 2, 3 S.
(3) **Automatic bladder**
(4) **Uræmia**
(5) **Urinary sepsis**

(3) **Rectum:** (*a*) **Ileus**
(*b*) **Constipation**
(*c*) **Incontinence:**
: Lumbar involvement

(4) **Genitals:** (*a*) **Priapism** esp. in cervical lesions
(*b*) **Impotence:**
: Caudal and sacral involvement

(5) **Motor paralysis and its sequelæ:**
: Contractures
: Deformities

(6) **Trophic:** Bed-sores

(D) GENERAL:
(1) **Shock**
(2) **Association with other injuries**

Treatment:

(I) FIRST AID:
(A) Immediate immobilisation and removal to hospital:
(*a*) In **prone** position
or (*b*) On **hyperextension** stretcher
(B) Treatment of shock
(C) Attention to other injuries

(II) *REDUCTION AND FIXATION:*
(1) **Anæsthesia:**
(*a*) **Local**; (*b*) Paravertebral; (*c*) General
(2) **Hyperextension with moulding:**
(*a*) Davis' **suspension** technique
(*b*) Watson-Jone's postural reduction:
(α) **Two tables** technique
(β) Leg raising technique
(3) **Plaster fixation:**
: Pelvis to axillæ and clavicles
: For 4 to 6 months

(*a*) Complete
(*b*) Double shell
(*c*) Single shell: (α) Anterior
(β) Posterior

or (3) **Reversible bed-frame of Hey Groves**

(4) **Ambulation and exercises**: (Bohler)

(A) Treatment of lumbar fractures:

(1) First aid: carriage prone with hyper-extension
(2) Initial X-Ray
(3) Anæsthesia: not necessary
(4) Preparation: (*a*) Stockinet
(*b*) Pads over bony points
(*c*) Two tables: high and low
(*d*) Plaster material
(5) Position: prone + hyper-extension
: Trunk entirely unsupported
(6) Plaster jacket:
(*a*) Ant: symphysis—groin—trochanters
↓ Clavicles ↓
(*b*) Lat: trochanters
↓ axillae ↓
(*c*) Post: gluteal cleft
↓ scapullae ↓
(7) After-treatment:
(*a*) Abdominal window:
Ind: (α) Respiratory distress
(β) Abdominal distension
(*b*) Change of position: every two hours
Sit up: after 24 hours
Walk: after 8–10 days
(*c*) Spinal and abdominal exercises
(*d*) Check X-Ray and new plaster:
: After 4 weeks.
(*e*) Retention of jacket:
: 16 to 24 weeks (Renewed every 6 weeks)
(*f*) Mobilisation exercises:
: After discarding the jacket

(B) Treatment of dorsal fractures:

(1) Position:
: Supine with kidney bridge under the fractured vertebra
(2) Plaster: From pelvis to chin

(C) Treatment of cervical injuries:

(1) Crush fracture:
Fixation:
In: Patient looking to the ceiling
By: Plaster-of-Paris
Extent: Pelvis → vertex → eyebrows
For: 12 weeks
(2) Sprain: Felt surgical collar: for a few weeks

(3) Subluxation: As in (1)
(4) Recurrent subluxation:
  (A) Immobilisation in plaster for 16 weeks
  (B) Operative fusion by bone graft
  ↓ *Plaster fixation for 24 weeks*
(5) Dislocation:
Treat: (A) Traction and manipulations under anæsthesia
  or (B) Skeletal weight traction by callipers:
    (*a*) Gallie's: 20–30 lbs. for 10–15 min.
    (*b*) Prolonged: for 3 weeks
After-treat: Fixation:
  In: Neck hyper-extended
  By: Plaster cast
  Extent: Head to upper thorax

(D) Treatment of vertebral fractures with paraplegia:
(1) First aid: Keep the spine straight
  Never allow the spine to sag
(2) *Immediate reduction and fixation:*
  (*a*) Lumbar: Plaster jacket
  (*b*) Dorsal: Plaster bed + skeletal traction
  (*c*) Cervical: Skull traction
(3) Treatment of complications: (See below)
(4) After-treatment:
  : Plaster jacket on recovery from paraplegia

(III) TREATMENT OF COMPLICATIONS:

(1) **Chest: Anti-pneumonic** preventive treatment

(2) **Bladder:**
  (*a*) Urinary **antiseptics and diuretics**
  (*b*) **Manual expression:** Every 4–6 hours
  (*c*) Distension and overflow
  (*d*) **Aseptic catheterisation:**
    (α) Intermittent
    (β) **Continuous**
  (*e*) Suprapubic cystostomy:
  Ind: (α) Cauda equina lesion
    (β) Urinary infection
    (γ) *Uræmia*

(3) **Rectum:**
  (*a*) Acetyl choline: for ileus
  (*b*) Flatus tube
  (*c*) Laxatives
  (*d*) Turpentine enemata

(4) **Priapism:**
  (*a*) **Aspiration of corpora**
  (*b*) Incisions into corpora
  (*c*) Ligature of both dorsal arteries

(5) **Paralysis:**
  (*a*) Splints or bandages in optimum position

(*b*) Massage: in flaccid paralysis

(6) **Trophic ulcers:**

(*a*) Protection of all pressure points by **elastoplast**
(*b*) Changing positions
(*c*) Dryness + cleanliness
: Boxax, spirit, 1% formaldehyde
(*d*) **Tannic acid treatment**

(7) **Plaster complications:**

(A) Respiratory embarrassment }
(B) Acute dilatation of the stomach } :
Treat: (1) Abdominal or chest window
(2) Plaster shell
(C) Plaster sores

(IV) OPERATIVE TREATMENT:

(1) **Fracture:**

Ind: (A) **Early: Within two days**
(1) Compound fracture:
: With **leakage of c. s. f.**
(2) Retention of **foreign body**
(3) **Depressed fracture of laminæ:**
: With projection into the spinal canal
(4) **Impacted dislocation**
(5) Gravitation paraplegia of **Thorburn**

(B) **Delayed: From 3 to 8 weeks**
(1) **Stationary in complete damage:**
: Extensor reflex with no improvement
(2) Partial recovery → stationary condition
(3) Progressive damage due to **compression**
(4) Late cord symptoms:
: Serous meningitis
(5) **Pain:** In caudal lesions

Contraind: (1) **Concussion period:** First three weeks
(2) **Satisfactory progress**
(3) **Complete transection syndrome:**
(*a*) Mass reflex
(*b*) Automatic bladder
(*c*) Paraplegia in flexion

Tech: (1) Open reduction
(2) Laminectomy
(3) Excision: of required parts

(2) **Complications:**

(A) **Obstinate urinary infection:**
: Suprapubic cystostomy
(B) **Bed-sores:** Nerve stretching
(C) **Deformities:**
(*a*) Tenotomies
(*b*) Tendon transplantations

(*c*) Tenodesis
(*d*) Arthrodesis

(D) **Hypertonus:**
(*a*) Tenotomies
(*b*) Nerve operation: Stoffel
(*c*) Posterior rhizotomy: Forster

(E) **Pain:**
(*a*) Posterior rhizotomy: Forster
(*b*) Antero-lateral chordotomy: Spiller

(IV) INFLAMMATIONS OF THE SPINE:

(A) TRAUMATIC INFLAMMATIONS:

(1) KUMMELL'S DISEASE:

Def: **Post-traumatic, hyperæmic osteoporosis** leading to collapse of a vertebral body

Site: 12 D; 1 L.

Clinic: (1) **History** of compression fracture
(2) Latent period: 6 months to 6 years
(3) **Pain + tenderness + wedge-deform.**
(4) Paraplegia + girdle pain: occasional
(5) **X-Ray**: Lateral

Treat: (1) Conservative:
(A) **Hyperextension plaster**
↓ *(B) Taylor's spinal brace*
(2) Operative: Bone-graft

(2) POST-TRAUMATIC OSTEOARTHRITIS:

: Aggravation of previously present osteoarthritis by trauma

(B) INFECTIVE INFLAMMATIONS:

(1) ACUTE INFECTIVE OSTEOMYELITIS:

Etio: Age: 5 to 15
Inf: Staphylococcus aureus

Path: (*a*) Primary staphylococcal focus
↓ (*b*) Pyæmia
↓ (*c*) Osteomyelitis: lamina or vertebral body
↓ (*d*) *Embolic infection of the fat*
↓ (*e*) Direct lymphatic extension

Clinic: (1) Constitutional **toxæmia**
(2) Intense pain in the back
(3) **Local acute inflammatory signs**
(4) Referred signs of pressure: paraplegia
: root pains

Diff. diag: (1) Meningitis
(2) Acute abdomen

(3) Acute fevers
(4) Acute myositis or fibrositis

Compl: (1) Abscesses: (*a*) Muscular
(*b*) Extradural
(2) **Septic meningitis**
(3) Acute **vertebral necrosis**
(4) Compression paraplegia

Prognosis: Bad

Treat: (A) Local:
(1) Free removal of bone
(2) Drainage of the abscess
(3) Support to the spine
(B) General:
: Antiseptic chemotherapy
: Sulphonamides group
: Vaccines
: Pharmasol manganese and tin

(C) SPECIFIC INFLAMMATIONS.

(1) TUBERCULOSIS OF THE SPINE:

Syn: **Pott's disease**

Etio: Age: (*a*) **Children** under ten
(*b*) **Adolescents**
Site: (*a*) 10 D to 3 L.
(*b*) Cervical

Path: Origin: (A) **Endosteal → angular deformity:**
: Children
(B) **Periosteal → gradual kyphosis:**
: Adults

Morb. anat: (A) Rarefying osteitis → Compression
↓ (B) Ankylosis in **angular deformity**
or (C) Caseation
↓ (D) **Cold abscess**
↓ (E) Migration
or (F) Compression paraplegia

Clinic: (1) **Pain**: (*a*) Local
(*b*) Referred: root pains
(2) **Tenderness**: (*a*) Local
(*b*) Referred:
(α) Tap on head
(β) Tap on sole
(3) **Spasm**: (*a*) Rigid back or neck
(*b*) Restricted movements
(*c*) Coin-on-the-floor test
(4) **Deformity**:
(*a*) **Prominent spinous process**
(*b*) **Angular**: In children
(*c*) **Gradual**: In adults

(α) Dorsal: exaggerated kyphosis
(β) Cervical or lumbar:
: Lessened normal lordosis

(5) **Cold abscess:**

Clinic: (*a*) Non-inflammatory cystic swelling
(*b*) Migration to distant parts
(*c*) Tendency to silent bursting

Sites: (A) **Cervical:**
(1) **Retropharyngeal**
(2) **Posterior cervical**
(3) **Axillary**
(4) Mediastinal

(B) **Dorsal:**
(1) Mediastinal
(2) **Paravertebral**
(3) **Intercostal**
(4) Abdominal wall

(C) **Lumbar:**
(1) **Psoas:** (*a*) Iliac
(*b*) Scarpa
(*c*) Gluteal
(*d*) Ischio-rectal
(2) **Paravertebral:** Lumbar

(6) **Compression spastic paraplegia:**

Cause: Pressure of inflammatory products:
(*a*) Pachymeningitis
(*b*) Œdema
(*c*) Fibro-lipomatous sclerosis
(*d*) Cold abscess

Clinic: (A) Early stage:
(1) Spastic paraplegia
↓ (2) Sensory disturbances
↓ (3) Loss of sphincter control

(B) Later stage of complications:
(1) Ascending urinary infection
(2) Contractures
(3) Bed-sores

(7) **X-Ray:** (A) Antero-posterior
(B) Lateral

Pictures: (1) Worm-eaten appearance
(2) Rarefaction
(3) Compression-collapse
(4) Shorter inter-vertebral space
(5) Bony ankylosis
(6) Cold abscess shadow

Clinical pictures at different levels :

(A) **Cervical :**
- (1) **Fixation of head**
- (2) Pain in 2nd cervical nerve area
- (3) Straightening of cervical spine
- (4) **Cold abscess :**
  - (*a*) Retropharyngeal
  - (*b*) Posterior cervical

(B) **Dorsal :**
- (1) **Rigid back**
- (2) Intercostal or abdominal girdle pain
- (3) **Local deformity :** Kyphosis
- (4) **Cold abscess :**
  - (*a*) Intercostal
  - (*b*) Paravertebral

(C) **Lumbar :**
- (1) **Rigid back**
- (2) Hypogastric or sciatic pain
- (3) **Straightening of lumbar spine**
- (4) **Cold abscess :**
  - (*a*) Lumbar
  - (*b*) Psoas

Complications :

(A) **General :**
- (1) Miliary tuberculosis
- (2) Tuberculous exhaustion
- (3) Amyloid disease

(B) **Distant :**
- (1) **Tuberculosis elsewhere :**
  - (*a*) T. B meningitis
  - (*b*) T. B. lungs
  - (*c*) T B. intestines
- (2) Intercurrent complications

(C) **Local :**
- (1) **Cold abscess**
- (2) **Compression paraplegia**

(D) **Sequelæ :**
- (1) **Urinary infection**
- (2) **Ileus**
- (3) **Chest complications**
- (4) **Bed-sores**
- (5) **Contractures**

Treatment :

Aim : **Bony ankylosis** in the position of least deformity

Steps : (1) **Rest with correction of deformity**

(2) **Immobilisation of spine in corrected position :**
- (A) **Conservative :** Plaster jacket
- (B) **Operative :** Bone graft

(3) **Treatment of complications**
(4) **Treatment in convalescence**

(1) **Rest with correction of deformity:**
(A) Recumbency:
In: (*a*) Bed
(*b*) **Hyper-extension frame**
(*c*) Plaster bed
With or Without : Weight extension and counter-extension
Position: (*a*) Hyper-extended supine
(*b*) Prone
Duration : Disappearance of acute clinical signs
(B) **Plaster-of-Paris**

(2) **Immobilisation of spine in corrected position:**
(A) **Conservative:**
(1) **Plaster-of-Paris: Jacket**
Tech: (*a*) Repeated plasters:
: After graduated corrections
(*b*) Plaster with local pressure
Extent: (*a*) **Cervical:**
: **Iliac crests → chin and occiput**
(*b*) **Dorso-lumbar:**
: **Iliac crests → axillæ**
+ **Symphisis pubis → suprasternum**
Duration: (*a*) Clinical and radiological ankylosis
(*b*) **Two years** average
(2) **Splints:** Double Thomas' hip splint
(3) **Frames:** Bradford
. Whitman
: Phelps
(B) **Operative:**
Tech: (1) **Hibbs':** Interlocking of split spines
(2) **Albee:** Tibial graft between split spines
Ind: (1) Lumbar or lumbo-sacral lesion
(2) **Puberty**
(3) **Late and stationary stage**
(4) Healthy skin
(5) Fibrous painful ankylosis
(6) Laborious occupation
Contraind: (1) **Children**
(2) **Early and progressive cases**
(3) Bad general and local conditions
Post. treat: (*a*) Plaster shell (anterior): for two weeks
(*b*) Plaster jacket: for six months
(*c*) Celluloid jacket: for further six months

(3) ***Treatment of complications:***
(A) **Cold abscesses:**

(1) **Aspiration:**
- (a) Healthy (avascular) skin
- (b) Non-dependant position
- (c) Valvular tract
- (d) Large bore needle: (about 15' B.D. Gauge)

(2) **Aspiration + injection:**
- (a) **Iodoform in oil:** 5–20 c.cs.
  - Iodoform: grms. V
  - Ether: grms. V
  - Guiacol: } āā grms. II
  - Creosote: }
  - Sterile olive oil: *100* c.cs.
- (b) **10% Iodoform in sulphuric ether:**
  - : *5–10* c.cs.
- (c) **10% Iodoform in glycerine:**
  - : 4 drachms
- (d) Thymol · 1 part
  - Camphor . *2* parts
  - Ether . 3 parts
  - Ind: *Caseous and thick pus*

(3) **Incision—**evacuation—scraping—BIPP—
↓ **Closure without drainage**
Ind: (a) Recurrences after repeated aspirations
(b) Healthy skin

(B) **Compression paraplegia:**
- (a) **Postural treatment:**
  - : *Recumbency in hyper-extension*
- (b) **Laminectomy:**
  - : *Treat the cause of pressure*
- (c) **Costo-transversectomy:**
  - : *Evacuation of tuberculous debris*
- +(d) **Prophylactic treatment of sequelæ:**
  - (1) Chest
  - (2) Intestinal
  - (3) Urinary
  - (4) Contractures
  - (5) Trophic

  (See page 818)

(4) **Treatment in convalescence: Spinal supports**
- (1) Poroplastic jacket
- (2) Celluloid jacket
- (3) Leather jacket
- (4) Taylor's brace

Treatment stages: Whole course 2 years from the start

(1) **Acute stage: Recumbency in hyper-extension with or without weight extension and counter-extension**

Duration : (*a*) **3–6 months**
(*b*) **Disappearance of acute signs :**
: (Pain, tenderness, spasm)

↓ (2) **Chronic stage : Plaster jacket in corrected position**
Duration : (*a*) **6–12 months**
(*b*) **Bony ankylosis :** (α) **Clinical**
(β) **X-Ray**

↓ (3) **Convalescent stage : Celluloid or leather jacket**
Duration : 12 months more

+(4) **All stages : Anticomplication management :**
(See page 818)

(2) SYPHILITIC OSTEITIS OF THE SPINE:
Path : (*a*) Gumma } : endosteal, affects only one vertebra
(*b*) Dry caries } marked sclerosis
Clinic : (*a*) Same as T. B. with :
(α) No deformity
(β) No cold abscesses
(*b*) Other syphilitic stigmata
(*c*) Wassermann
Treat : Antisyphilitic remedies

(3) GONOCOCCAL SPONDYLITIS:
Etio : Gonorrhœa
Path : Inflammation of periarticular ligaments
Clinic : (*a*) History of **gonorrhœa**
↓ (*b*) Painful and tender spinal **ligaments**
+ (*c*) Painful movements of the spine

(4) RHEUMATIC SPONDYLITIS.
Path : Rheumatic **fascitis**
Clinic : Painful and tender lumbar fascia : **lumbago**
Treat : (1) Rest and **salicylates**
(2) Tonsillectomy : (if required)

(5) TYPHOID SPINE:
Clinic : (1) **History** of recent typhoid
(2) Marked pain + tenderness + rigidity
(3) No deformity and abscesses

(D) DEGENERATIVE INFLAMMATIONS:

(1) SPONDYLOSIS DEFORMANS:
Def. Changes in spine increasing with age
Etio : Age above 40
Path : (*a*) Isolated calcified patches in ligaments
(*b*) Osteophytic growths
(*c*) Vertebral deformity
Treat : Vasectomy

(2) SPONDYLITIS DEFORMANS:
Syn : Osteoarthritis of the spine

Etio: (*a*) Elderly people
(*b*) Laborious occupations
Path: (1) Bones: osteophytes + bony hypertrophy
(2) Ligaments: ligamentous and capsular calcification and ossification (Syndesmophytes)
(3) Blood: rise in blood-calcium
Clinic: (1) Pain: (*a*) Local
(*b*) Referred: **Root-pains**
(2) Rigidity → immobility: **Poker back**
(3) Deformity: **Kyphosis**
(4) X-Rays: (*a*) Osteophytes
(*b*) Syndesmophytes
Clinical types: (1) **Marie-Strumpell:**
(A) Spondylitis
+ (B) Proximal arthritis:
: Hips and shoulders
(2) **Von Bechterew:**
: Cervico-dorsal spondylitis with marked root pains
Treat: (1) Treat all primary **septic foci**
(2) **Physiotherapy**
(3) Plaster fixation: in painful stage
(4) Para-thyroidectomy: unilateral
Ind. High blood-calcium
(5) Vasectomy

(3) CHARCOT'S DISEASE
Clinic. (1) **Painless,** irregularly angular kyphotic **deformity**
+(2) Tabes dorsalis, syringomyelia

(V) NEW GROWTHS OF THE VERTEBRAL COLUMN AND SPINAL CORD:

Etio: Age: between 20 and 50
: (Tuberculoma under 10)

Classification:

(A) **Tumours of the vertebræ:**
(1) Chondroma
(2) Osteoma
(3) Angioma
(4) Multiple myeloma
(5) Primary sarcoma
(6) **Secondary carcinoma:**
• Primaries: Breast, thyroid, bronchus, prostate, kidney, stomach, uterus

(B) **Tumours in the spinal canal:**
(1) **Extradural:** 25%
(*a*) Bony and cartilaginous growths:

(1) **Secondary carcinoma**
(2) Sarcoma
(3) Chondroma
(4) Osteoma
(5) Myeloma
(6) Osteophytes

(*b*) Lipoma
(*c*) Neuro-fibroma
(*d*) Hæmangioma
(*e*) Chordoma

(2) **Intradural extramedullary :** 50%
(*a*) Psammoma } **meningioma**
(*b*) **Endothelioma** } **meningioma**
(*c*) **Neuro-fibroma :** From nerve roots
(*d*) Fibro-sarcoma
(*e*) **Tuberculoma**

(3) **Intradural intramedullary :** 25%
(*a*) **Glioma**
(*b*) Tuberculoma
(*c*) Gumma
(*d*) Ependymoma

(4) **Dumb-bell tumours :** (Neuro-fibroma)
: Partly intradural and partly extradural with a narrow neck in between

Clinic : The cause of clinical signs and symptoms of a spinal tumour, is the **interference with the functions of the spinal cord and its nerve roots by pressure or involvement.**

Stages : (1) **Stage of root involvement :**
(*a*) Unilateral
↓ (*b*) Bilateral

Clinic . (*a*) Pain + hyperæsthesia
↓ (*b*) Anæsthesia

(2) **Stage of advancing unilateral pressure :**

Clinic : (*a*) Root irritation
↓ (*b*) Motor paralysis

(3) **Stage of Brown-Sequard syndrome :**

Clinic : (A) Homolateral :
(α) Motor loss
(β) Muscular sensation loss
(B) Contralateral :
(α) Sensory loss
(β) Loss of pain and temperature sense

(4) **Stage of complete transection :**
: Partial → complete bilateral motor and sensory paralysis with trophic changes

Signs: (A) **Vertebral tumours:**

(1) **Pain:** (*a*) Local
(*b*) Referred: **root pains**

(2) **Bone involvement:**
: (*a*) Thickening
or (*b*) Collapse

(3) **Compression paraplegia:**
: Rapid **upper motor neuron** type with complications

(4) **X-Rays:** (*a*) New bone
(*b*) Rarefaction

(B) **Intradural extramedullary:** (See above)
(1) Root involvement: **root pains**
↓ (2) Unilateral pressure on cord
↓ (3) Brown-Sequard
↓ (4) Complete transection

(C) **Intradural intramedullary:**
(1) **Absence of root pains**
(2) Progressive transverse lesion:
: ***Lower neuron*** paralysis with trophic changes
(3) **Extending upper level**

Special tests:

(1) **Thecal puncture:**

(A) **Hydrostatic:**

(*a*) **Queckenstedt:**
: Bilateral jugular pressure *fails* to raise spinal C.S.F. pressure

(*b*) **Ayer:**
: Difference between C.S.F. pressures in:
(α) Cistern
(β) Spine

(B) **Chemical:**
: ***Froin's*** *syndrome:*
(α) Xanthochromia
(β) Increased protein
(γ) No increase in cells

(2) **Cistern puncture:**

(*a*) **Ayer:**
(α) Difference between cistern and lumbar pressures
(β) Queckenstedt present in cistern but absent in lumbar
(γ) Oscillations present in cistern but absent in lumbar

(*b*) **Heavy lipoidol** injection: 2 c.cs.

(3) **Radiological examination:**
  (*a*) **Plain:**
    (α) Increase in inter-pedicular distance
    (β) Decrease in pedicular height
    (γ) Rarefaction
  (*b*) **Lipoidol:** Block
  Tech: (α) 2 c.c. heavy: in cistern
    (β) 2 c.c. light: in lumbar

(4) **Wassermann or Kahn**

Special signs at different spinal levels:

(A) **Upper cervical:**
  (1) **Cervical or occipital neuralgia**
  (2) Phrenic involvement:
    : Irritation or paralysis of diaphragm
  (3) Cardiac irregularity
  (4) Pupillary changes: enophthalmos etc.
  (5) Hyper-pyrexia

(B) **Lower cervical and upper dorsal:**
  (1) **Neuralgia: Brachial**
    Intercostal
    Girdle
  (2) Paralysis of upper extremity muscles
  (3) Reflexes absent: triceps
    supinator
  (4) **Pupillary changes**

(C) **Lower dorsal:**
  (1) **Neuralgia: Abdominal**
  (2) Paralysis of abdominal parietes
  (3) Abdominal reflexes absent

(D) **Lumbar:**
  (1) **Sciatica**
  (2) Paralysis of lower extremity muscles
  (3) Reflexes absent: cremasteric
    knee
  (4) **Abnormal sphincters:** Bladder & rectum
    (incontinence)

(E) **Cauda equina:**
  (1) Neuralgia: back, perineum, genitals
  (2) **Sensory loss: Sacral**
  (3) Paralysis below the knee
  (4) **Abnormal sphincters:** Bladder & rectum
    (retention)

Diff. diag: (1) Transverse myelitis
  (2) Disseminated sclerosis
  (3) Syringomyelia
  (4) Vertebral disease
  (5) Gumma.

Treat: **Laminectomy and removal:**
  Tech: (A) One stage
    (B) Two stages
  Ind: **Slowly progressive, transverse lesion of the cord, where vertebral disease and syphilis can be excluded.**

(VI) COMPRESSION OF THE SPINAL CORD:

(1) **Vertebral causes:**
- (A) **Fracture or fracture-dislocation**
- (B) Inflammations:
  - (*a*) Acute osteomyelitis
  - (*b*) **Tuberculosis**
- (C) New growths:
  - (*a*) Benign : (α) Chondroma
    - (β) Osteoma
    - (γ) Myeloma
    - (δ) Chordoma
  - (*b*) Malignant: (α) Sarcoma
    - (β) **Secondary carcinoma**
- (D) Degenerative affections:
  - (*a*) **Osteitis deformans**
  - (*b*) **Osteoarthritis**

(2) **Meningeal causes:**
- (A) **Extradural:**
  - (*a*) Traumatic hæmorrhage: Thorburn
  - (*b*) Inflammation: **Tuberculosis**
  - (*c*) New growth: (α) Lipoma
    - (β) Hæmangioma
- (B) **Intradural:**
  - (*a*) Trauma: hæmorrhage
  - (*b*) Inflammations: (α) Pachymeningitis
    - (β) **Serous meningitis**
  - (*c*) New growths: (α) **Endothelioma**
    - (β) Hæmangioma

(3) **Medullary causes:**
- (A) Trauma: hæmatomyelia
- (B) Inflammations:
  - (*a*) Tuberculosis
  - (*b*) Gumma
- (C) Neoplasms:
  - (*a*) **Glioma**
  - (*b*) Ependymoma
- (D) Degenerations: **Syringomyelia**

(4) **Neural causes: Neuro-fibroma**

(5) **Extravertebral causes: Aneurysm**

(VII) ANTERIOR POLIOMYELITIS:

Def: **Destructive inflammation of the anterior horn of** the spinal grey matter, **leading to lower motor neuron type of paralysis** of the affected segments

Etio: (*a*) **Children** under 4 years
- (*b*) **Ultra-microscopic virus:**
  - : Through upper air passages

Path: Paralysis of anterior horn motor cells due to:
- : Œdema, hœmorrhage and ischæmia

Clinic. (1) ***Stage of invasion:***
- (*a*) **Febrile attack +** ***spine sign*** (stiff back)
- ↓ (*b*) Widespread **lower neuron paralysis:**
  - (α) Below the knee
  - (β) Above the elbow
  - (γ) *Shoulder girdle*

(2) **Stage of recovery: 2 months to 2 years**
- (*a*) Recovery of function
- (*b*) Reaction of degeneration
- (*c*) Faradic response

(3) ***Stationary stage: After 2 years***
- (*a*) Residual paralysis with no recovery
- (*b*) No faradic response
- (*c*) Muscles affected:
  - : Peronei, extensors of toes, feet and legs
  - : Shoulder girdle, biceps and supinators

(4) **Stage of deformities:**
- Etio: Neglect of prophylactic supports
- Time. During the stage of recovery
- Clinic: (1) **Talipes:** equino-varus or valgus
  - : calcaneo-valgus
  - (2) Knee : flexion
  - (3) Hip : abduction-flexion

Diff. Diag: (A) **Upper neuron:**
- (1) Spastic diplegia
- (2) Spastic paraplegia
- (3) Amyotrophic lateral sclerosis
- (4) Hereditary ataxy

(B) **Lower neuron:**
- (1) Spina bifida
- (2) Peripheral nerve trauma or inflammation
- (3) Neuro-muscular paralysis of tooth
- (4) Syringomyelia

(C) **Primary muscular paralysis**

(D) **Congenital deformities:** Talipes

(E) **Fevers**

Diagnosis: (1) **Age: Within 4 years**
- (2) **Capricious and asymmetrical**

(3) **Trophic changes**
(4) **Partial auto-recovery: *within two years***

Treat: (A) **Stage of acute extensive paralysis:**
- (1) **Painful stage:**
  - **: Complete rest in over-correction:**
    - (a) **Upper extremity:**
      - **: Abduct. + flex. + supin. + dorsiflex.**
    - (b) **Lower extremity:**
      - **: Extension + neutral position**
- (2) **Painless stage: Immobilisation:**
  - In: Over-corrected positions
  - **By: Splints** or retentive apparatuses
  - With: *Gentle massage and passive movements*

(B) **Stage of recovery:** 2 months to 2 years
- (1) **Fixation:**
  - **In: Relaxation of paralysed muscles**
  - By: Splints and surgical appliances
- (2) **Maintenance of nutrition:**
  - : Massage, physio-therapy, electro-therapy
- (3) **Exercises:** Voluntary

(C) **Stage of deformity:** After 2 years
- (1) **Division and sliding of soft structures**
  - ↓ Gradual or forcible correction of deformities
  - ↓ *Fixation in splints or plaster*
  - Tech: (a) **Tenotomy**
    - (b) **Tendon lengthening**
    - (c) **Division of fasciæ and ligaments**
    - (d) ***Sliding of muscles***
  - Sites: (1) Tendo Achilles: Bayer Z: in equinus
    - (2) Steindler: in equino-varus
    - (3) Hamstrings: in knee flexion
    - (4) Tensor fasciæ femoris & sartorius
    - (5) Souter's iliacus sliding: in hip flexion
- (2) **Tendon transplantation:**
  - : (See under Tendons)
  - Principles: (a) *Same innervation*
    - (b) Non-opposing groups
    - (c) Direct path
    - (d) Previous correction of deformity
    - (e) Fixation to bone
  - Ind. (1) Paralysed quadriceps:
    - : Biceps, Sartorius, Iliotibial band } into { patella
    - (2) *Paralysed peronei:*
      - : Tibialis ant. } into { Cuboid, Fifth metatarsal

(3) Paralysed Achilles:
: Peronei
Long flexors of toes } into { os calcis

(4) Paralysed extension of the hand:
: Flexor carpi rad.
Flexor carpi uln.
Palmaris long. } into { Ext. dig com.
Ext. of thumb

(3) **Tenodesis:**
: Tendo Achilles in heel drop

(4) **Arthrodesis:**
Ind: (*a*) Flail or deformed joint
(*b*) After the age of 12

Sites. (1) Shoulder
(2) Foot:
(*a*) Naughton Dunn: astragular head
cuneiforms
scaphoid
(*b*) Whitman: astragalectomy
(*c*) Lambrinudi: subastragaloid + midtarsal
(3) Knee

(5) **Amputation:**
Ind: (*a*) Extensive paralysis
+ (*b*) Trophic ulceration
+ (*c*) Stunted growth

(6) ***Ganglionectomy:***
Ind: Trophic phenomena

(7) **Bone-graft:** Hibbs
Ind: Flail spine

(VIII) SPINAL DEFORMITIES:

(1) SCOLIOSIS:

Def: Habitual **lateral deviation** of a part or the whole of the spinal column from the middle line

Etio: (1) **Congenital:** Wedge-vertebra
(2) **Static:** (*a*) Adolescent asthenia
(*b*) Abnormal posture habit
(*c*) Excessive fatigue
(*d*) Bad hygiene
(3) **Metabolic:** (*a*) Rickets
(*b*) Osteomalacia
(*c*) Hyper-parathyroidism
(4) **Paralytic:** (*a*) Infantile paralysis
(*b*) Syringomyelia
(5) **Compensatory:** Empyema, short limb
(6) **Spinal local disease**
(7) **Occupational**

Path: Factors: Etiology + gravity + habit
Stages: (1) **Incipient: Auto-correction**
: Simple postural curvature

(2) **Reducible : Passive correction**
: Adaptive changes in soft tissues
(3) **Irreducible : No correction**
: Structural changes in bones

Morb. anat : (*a*) Torsion of the trunk
↓ (*b*) Lateral inclination } of vertebræ
\+ (*c*) Rotation } of vertebræ

Clinic : (A) **Primary deformity :**
(*a*) **Primary curve :** C or S shaped
↓ (*b*) **Compensatory curves :**
: At both ends of (a)
(B) **Secondary deformity :**

Site	*Convex side*	*Concave side*
(1) Scapula	Projecting back	Forwards
(2) Chest :		
(*a*) Front	Flat	Projecting
(*b*) Back	Projecting	Flat
(3) Ribs	Separated	Crowded
(4) *Costo-cristal space*	Wide	Narrow
(5) Hip	—	Projecting back

(C) **Examine the patient :**
(*a*) Standing and bending forwards
(*b*) Sitting
(*c*) Prone
(*d*) In suspension

Compl : (1) Neuralgia
(2) Osteoarthritis
(3) *Lung complications*
(4) Heart failure

Treat : (A) **First stage :**
: Obliteration of the curve on flexion :
(1) General hygiene and tonics
(2) **Remedial exercises** + adequate rest
(3) **Postural re-education** of muscles
(B) **Second stage :**
(*a*) *Non-obliteration of the curve on flex.*
+(*b*) [illegible]

\+ (*d*) Lateral curve > rotation

(2) Wedging jacket } of Hibbs
↓ Spinal fusion
Ind: (a) Progressive curve in a growing child
(b) Severe curve with inbalance
(c) Deformity with pain and fatigue

(C) **Third stage:** *Bony changes*
: **Mechanical supports:** Plaster shell
Spinal corsets
Taylor brace

(2) KYPHOSIS:
Def: Increased **dorsal convexity** of the spine
Varieties: (1) **Congenital:** Wedge-vertebræ
(2) **Static:** 'Round shoulders'
(3) **Rickets or osteomalacia**
(4) **Local bone disease:**
(a) **Tuberculosis**
(b) Traumatic: ***compression fracture***
(c) Traumatic spondylitis: Kummell
(d) Secondary carcinoma
(5) **General bone disease:** Old age changes
(a) **Spondylosis** deformans
(b) **Spondylitis** deformans
(c) **Osteoarthritis** of the spine
(6) **Occupational**
(7) **Compensatory**
(8) **Scheuermann's disease:**
: *(See under Bones also)*
Etio: Age: 10–13 years
Site: Lower dorsal
History of trauma
Path: (a) Prolapse of nucleus pulposus into the spongiosa of vertebral bodies
or (a) **Vertebral epiphysitis**
↓ (b) Wedge-like vertebra
+ (c) Irregular intervertebral disc
Clinic: **After-traumatic kyphosis**
Stages: (1) ***Postural*** *stage: auto correction*
(2) **Soft tissue** stage: homo-correction
(3) **Bony** stage: no correction
Treat: (1) Active and passive exercises
↓ (2) Forcible correction → plaster
↓ (3) Spinal supports

(3) LORDOSIS:
Def: Exaggeration of the forward lumbar curve
Etio: (1) **Legs:** Equinus
(2) **Hips:**
(a) Flexion-contracture
(b) Congenital bilateral dislocation

(3) **Spine:**
  (a) Spondylolisthesis
  (b) Dorsal kyphosis: static or pathological
(4) **Abdominal weight:** Pregnancy, ascitis

Treat: (a) Treat the etiology
  (b) Spinal supports

(IX) SCIATIC-SCOLIOSIS SYNDROME:

Syn: Painful back
Clinic: (1) History of injury or inflammation
  (2) **Lumbar, gluteal and sciatic:**
    (a) **Pain,** (b) **Tenderness,** (c) **Spasm**
  (3) Sciatica with inability to raise the straight leg
  (4) Scoliosis and limping
  (5) Tender points with positive novocain test

Etiological classification:

(A) MUSCULAR AND FASCIAL LESIONS:

(1) *Myofascial and ligamentous injuries:*
  (A) Acute
  (B) **Chronic: postural**
    (a) **Sacro-spinalis and gluteal strain:**
      Clinic: (α) Sciatic scoliosis
        (β) Tender point:
          : Steindler novocain test
      Treat: (α) **Leriche's** repeated novocain injections: every third day
        ↓ (β) Active exercises
        (γ) Bandage-belt-jacket
    (b) **Fascial contractures following strain:**
      Clinic: (α) Sciatic scoliosis
        (β) Abduction contracture of hip
      Treat: (α) **Spinal manipulations**
        (β) **Ober's operation:**
          Ind: Painful thigh adduction
          Tech: Division from iliac crest: of
            (1) Ilio-tibial band
            (2) Fascia lata
        (γ) Stripping of post. sup. spine
    (c) **Sacro-sciatic and interspinous strain:**
      Varieties: (1) Acute
        (2) Chronic
      Clinic: (α) Sciatic scoliosis
        (β) Novocain test
      Treat: (α) **Leriche's** repeated novocain inj.
        ↓ (β) **Manipulations**
        (γ). Excision of spinous processes

(2) *Myofascial inflammations:*
- (a) Traumatic
- (b) Infective
- (c) Specific

(B) BONE LESIONS:
- (a) Traumatic ankylosis
- (b) Traumatic spondylitis: Kummell
- (c) Osteoarthitis
- (d) Secondary carcinoma

(C) JOINT LESIONS:

(1) *Spondylitis:*
- (a) Traumatic arthritis
- (b) Interarticular arthritis
- (c) Spondylitis deformans
- (d) Infective spondylitis: (α) Rheumatoid
  (β) Osteoarthritis

(2) *Lumbo-sacral affections.*
- (a) **Lumbo-sacral arthritis:** Traumatic
- (b) **Sacralisation of 5 L. vertebra:**

Path: (α) Skeletal complex:
. Unnatural articulation
(β) Sciatic complex:
· Traction on nerve roots

Clinic: Sciatica

Treat: Excision of transverse process
Ind: Presence of both complexes

(c) **Spondylolisthesis:**

Def: Forward displacement of 5L vertebral body over the sacrum

Etio: **Age: 11-12 years**
Male: 70%
- (a) **Congenital:**
  : Ill-developed pedicles and laminæ
- (b) **Traumatic**
- (c) **Occupational**
- (d) **Osteoarthritic**

Path: (1) Disunion of laminæ from centrum
(2) No disunion
(3) **Associated deficiency of laminæ of** 4 and 5L vertebræ in 50% of cases

Clinic: (1) **Hollow at the sacral top:**
- (a) **Lordosis**
- (b) **Sacrum vertical and projecting**

(2) Descent of ribs
(3) Lowered stature
(4) Local and referred pain
(5) **X-Ray:**
- (a) **A.P.:** Convex bow over sacrum

(b) **Lateral:**

(α) Antero-posterior thickness of 5L is more than that of 4L.

(β) Ullman's sign:

: Anterior margin of 5L more forward than sacral plane

Treat: (1) **Rest and supports**

(2) **Manipulative reduction:**

Ind: (a) Within a few months

(b) Before the age of 15

Tech · Anæsthesia

↓ Obliterate the lumbar lordosis

↓ Flex the hips fully + traction

(3) **Operative fusion:**

Tech: (a) Preliminary traction

↓ (b) Posterior fusion: Albee
Hibbs

or (b) Anterior fusion

After-treat. Plaster with hips in flexion

↓ Gradual extension of hips

(3) *Sacro-iliac affections:*

(A) **Trauma:**

(a) **Sacro-iliac strain:**

Etio: (α) **Acute** strain or trauma

(β) **Postural**

(γ) **Pregnancy**

Clinic: (α) Diminution of lumbar curve

(β) **Pain on compression of the ilia**

(γ) Pain over the joint by flexion of the thigh with knee extended

(δ) **Local tenderness**

Treat: (1) ***Manipulative:***

↓ Strapping

↓ Diathermy

Tech: (α) Oral sodium amytal 3 grs.

↓ (β) 20–30 c.cs. of 1% procaine into joint

↓ (γ) Flexion hip with extended knee

(2) **Retentive apparatus:** Belt

(3) **Arthrodesis**

(b) **Sacro-iliac subluxation:**

(α) Forward inclination of the sacrum

(β) Backward inclination of the sacrum.

(B) **Infective arthritis**

(C) **Tuberculosis**

(D) INTERVERTEBRAL DISC LESIONS:

(1) Trauma: (See under Spinal Trauma)

(2) Scheuermann's disease: (See under Kyphosis)
(See under Bones)

(E) STATIC CAUSES:
- (1) Lordosis
- (2) Kyphosis
- (3) Scoliosis

(F) SECONDARY:
- (1) Abdominal or **pelvic disease (gynaec)**
- (2) Limb deformity:
  - (a) Short leg
  - (b) Flat feet

(G) POST-TRAUMATIC SPINAL NEURASTHENIA:

Diagnosis of painful back or sciatic-scoliosis syndrome:

Steindlers' procaine test:

Tech: Local injection of 5–10 c.cs. of 1% procaine:
: In the painful spot

Interpretation: Pain is reflex: if
- (a) Puncture aggravates local and referred pain
- (b) Inj. cures local tenderness and referred pain

Ind: (a) If positive: conservative treatment
- (b) If negative: operative treatment

Treatment of painful back:

(1) **Treat the etiology**

(2) **Conservative:**
- (a) **Prophylactic:** Rest and **correction of posture**
  : Avoidance of strain
- (b) **Acute stage: Rest** in bed with hot packs over lumbo-dorsal region (Diathermy)
- (c) **Subacute stage:** Adhesive elastic **strapping**
  With: Hips and legs: in
  - (α) Abduction
  - \+ (β) Flexion
  - \+ (γ) Eversion

  Extent. Great trochanter
  ↓ 4 L. vertebra
- (d) **Chronic stage:**
  - (1) **Manipulations**
  - (2) **Plaster** in lumbar hyperextension
- (e) **Convalescence:** Exercises
  Physiotherapy
  Electrotherapy

(3) **Injection treatment:** (See under Sciatica)
: Endoneural and epidural saline injections

(4) **Operative treatment:**
- (a) **Ober's fasciotomy:** (See above)
- (b) **Spinal fusion:** Hibbs

(5) **Spinal supports,** belts, corsets, jackets etc.

(X) OPERATIONS ON THE SPINE AND CORD:

(1) LAMINECTOMY:

Indications: (1) **Trauma:**

(A) *Immediate:* (3 days)

- (*a*) **Compound fracture:**
  : With cerebrospinal leak
- (*b*) Foreign bodies: **broken needles**
- (*c*) **Depressed fracture** of laminæ
- (*d*) **Impacted dislocation**
- (*e*) **Thorburn's** gravitational paraplegia

(B) *Intermediate:* (3-8 weeks)

: **After spinal shock has passed**

- (*a*) Signs of **incomplete interruption:**
  : (Extension paraplegia). with
  - (α) Progress at standstill
  - (β) Progress delayed
  - (γ) Retrogression of progress
- (*b*) Injury to **cauda equina**
- (*c*) Severe and persistent **root pains**
- (*d*) **Spinal compression**
- (*e*) **Foreign body** near the cord

(C) *Late:*

: **Meningitis serosa circumscripta:**

- (*a*) Residual symptoms
- (*b*) Slow reappearance of symptoms

(2) **Inflammation:**

- (A) Acute **osteomyelitis** of neural arch
- (B) **Pott's disease:**
  - (*a*) Laminar disease
  - (*b*) Intractable root pains
- (C) Meningitis serosa circumscripta

(3) **Spinal compression by new growths:**

- (A) **Vertebral**
- (B) **Extradural**
- (C) **Intradural extramedullary**
- (D) **Intramedullary**
- (E) **Dumb-bell**

(4) **Intractable pain or spasticity:**

- (A) Cauda equina or **nerve root injuries**
- (B) Ascending neuritis: **causalgia**
- (C) **Pressure** on nerve trunks
- (D) Implication in **malignant** tumours
- (E) Painful crises of **tabes dorsalis**
- (F) **Spastic diplegia**

in which spinal reflex arcs are in communication with higher centres.

(26) Complete transection:
- (a) Paraplegia in flexion: complete and non-improving
- (b) Mass reflex
- (c) Automatic bladder.

(27) Incomplete transection:
- (a) Paraplegia in extension: incomplete and improving
- (b) Absence of mass reflex.

(28) Retention of full consciousness enables a differential diagnosis of cervical fracture from fracture base of the skull with intracranial compression.

(29) Every case of severe spinal injury, should be submitted without undue delay to X-Ray examination.

(30) In fractures of the vertebral body, lateral view is better than antero-posterior:

Films. (a) Immediate lateral
- (b) Immediate lateral in flexion
- (c) Delayed lateral: after two weeks.

(31) In cervical injuries, take lateral views with spine fully flexed.

(32) Injuries of the spinal cord may occur without fractures or dislocations of the spinal column: such as
- (1) Extension quadriplegia:
  : Immediate short-lived paralysis of all limbs
- (2) Hæmatomyelia:
  : Loss of pain and temperature senses.

(33) Most common causes of death in spinal fractures are:
- (a) Urinary complications
- (b) Lung complications
- (c) Trophic phenomena with gradual sinking condition.

(34) Bladder condition in spinal fractures:
: Supra-lumbar injuries: automatic bladder
: Lumbar injuries: active incontinence
: Caudal & sacral injuries: passive incontinence

(35) Anatomy of urination with symptoms in trauma:

(A) 2 L. & 3 L.: Sympathetic
Function: (a) Inhibitory to detrusor
(b) Tonic to sphincter
Symp: Active incontinence

(B) 2 S. & 3 S.: Parasympathetic
Function: (a) Tonic to detrusor
(b) Inhibitory to sphincter
Symp: Retention.

(36) Sequelæ of spinal trauma:
- (1) Chronic backache
- (2) Spinal neurasthenia
- (3) Nuclear escape: Scheuermann
- (4) Kummeli's disease
- (5) Osteoarthritis.

(37) Pain is a frequent and grave complication of cauda equina injuries.

(38) First-aid workers should be taught that a patient with an injury to the spine must be carried face downwards with hyper-extension of the spine.

(39) Defer the clinical examination of fracture spine until shock has been treated.

(40) Morphia in a case of spinal fracture causes abdominal distension and predisposes to ileus.

(41) Treatment of dorso-lumbar flexion fractures:
: Reduction by hyper-extension → plaster jacket.

(42) **Vertebral fractures which must not be hyper-extended are:**

(*a*) Fract.-dislocation with locking of art. processes:
Treat: Operative excision of articular processes of upper vertebra and reduction of deformity
(*b*) Hyper-extension lumbo-dorsal fractures
(*c*) Comminuted fracture with neural canal involvement
Treat. Plaster in upright position with head traction
(*d*) Spondylolisthesis:
Treat: (1) Manipulations in flexion
or (2) Operative fixation
+ (3) Plaster in hip flexion.

(43) Fracture spine with paraplegia:

Stages: (1) General shock. 48 hours
(2) Flaccid paralysis: upto 3 weeks
(3) Reflex action

Treat: (1) Position:
(*a*) Turnable bed of Hey Groves
(*b*) Hyper-extending stretcher
(*c*) Prone
↓ (2) Radiography: after shock is over
(*a*) Antero-posterior
(*b*) Lateral
↓ (3) [illegible]
([illegible]
+ ([illegible]
+ (*c*) Local manipulations
↓ (4) Plaster cast: bed or shell

+ (5) Treatment of complications:
  - (a) Chest
  - (b) Urinary
  - (c) Constipation
  - (d) Bed-sores
  - (e) Contractures
  - (f) Priapism

? (6) Lumbar puncture: if necessary
  - (a) *Diagnostic*
  - (b) Decompression.

(14) Fractures presenting paralysis should be rectified as soon as possible, whereas in fractures without paralysis it is usual to wait for a few days.

(45) *In spinal injuries with paraplegia, lumbar puncture is* valuable in diagnosis and treatment.

(46) Operation for the treatment of actual cord injury is never necessary as an immediate procedure. From three to eight weeks after the injury is the most suitable period.

(47) More nearly the symptoms approximate to those of a total interruption of conduction after the spinal shock has passed off, the less likely is direct operative treatment of the spinal lesion to be of any real value.

(48) Operation is useful only in those cases where the lesion is incomplete and shows some power of spontaneous improvement.

(49) No operation for spinal injury:
  - (a) Within first three weeks
  - (b) Complete transection of the cord.

(50) If it is impossible to bring about reduction of a spinal fracture by hyper-extention, it signifies that there is locking of the articular processes, which requires open resection before the application of a plaster cast.

(51) Time for laminectomy in spinal injuries:
  - (1) *Immediate*: (a) *Compound fracture*
    - (b) Leakage of c. s. f.
    - (c) Foreign bodies
  - (2) Early: (2 days)
    - (a) Fracture of the arch with projection into the spinal canal
    - (b) Dislocation with locking articular processes
  - (3) Late: (3–8 weeks)
    - : Incomplete lesion with no tendency to improve.

(52) Repair of spinal fractures is rapid and consolidation is sufficient for weight bearing in about 8 weeks but the plaster jacket should be left on for 3–6 months.

(53) (A) Fractures without paralysis:
: Complete plaster cast
(B) Fractures with partial paralysis:
: Complete plaster cast
(C) Fractures with complete paralysis:
(*a*) Plaster shell
+ (*b*) Continuous traction by tibial tubercle pins
+ (c) Braun's splint.

(54) Extent of plaster jacket:
(1) Cervical spine:
(*a*) Upper: head, neck and chest
(*b*) Lower: neck and chest
(occiput behind to chin in front)
(2) Dorsal and lumbar spines:
(*a*) Front: upper end of the sternum and clavicles to the symphysis pubis and Poupart
(*b*) Back: highest dorsal vertebra to sacrum
(*c*) Lateral: axillæ to great trochanters
(*d*) Window over the chest and abdomen.

(55) Complications of plaster jacket for spinal injuries:
(1) Respiratory embarrassment
(2) Acute dilatation of the stomach
(3) Plaster sores.

(56) In spinal fractures without paraplegia, start active exercises immediately:
(1) Arms
(2) Knees
(3) Hips
(4) Back
(5) Balancing weights.

(C) **Inflammations:**

(57) Kummell's disease consists of development of painful back with wedge-shaped deformity of a vertebra, following definite spinal trauma, is due to post-traumatic hyperæmic osteoporosis and should be treated either by plaster in hyper-extension or bone-graft fixation.

(58) Treatment of Pott's disease is to produce bony ankylosis with the least possible deformity.

(59) Always evacuate a cold abscess before taking an X-Ray picture for caries spine.

(60) Endosteal T. B. with angular curve: children
Periosteal T. B. with gradual curve: adults.

(61) Paraplegia is seldom the result of gross spinal deformity. It almost always results from the pressure of inflammatory products upon the cord.

(62) Treatment of Pott's paraplegia is always conservative.

(63) Bone-grafting on T. B. spine does not lessen the period of convalescence and is contraindicated in children.

(64) Fusion operations of the spine should only be done in the late stages of the disease after all the spread has ceased and then only in specially selected cases. It should never be done in children and in early or progressive stages of the disease.

(65) Bone-graft operations done on early cases of T. B. spine prevent the natural collapse of a vertebra by which normal recovery takes place.

(66) The whole conservative course of the treatment of Pott's disease should not be less than two years from the start and the whole course should be followed by periodic X-Ray examinations.

(D) Tumours :

(67) Tumours of the spinal canal.
  (1) Extradural. 25%: Bony
  (2) Intradural extramedullay. 50%
    : Endothelioma or neuro-fibroma
    : Root pains prominent
  (3) Intramedullary: 25%
    . Glioma
    Absence of root pains
  (4) Dumb-bell: extra and intra dural.

(68) Spinal tumours are most common in thoracic region:
  : Most common spinal tumour is extramedullary.
  : Most common position is posterior or postero-lateral to the sensory roots.

(69) Upper level of sensory impairment provides the most important evidence of the level of spinal tumours.

(70) Root pains occur most characteristically with the mobile tumour of the posterior root (neuro-fibroma). The pain comes on movements or straining.

(71) Signs of Pott's disease in old age:? secondary carcinoma.

(72) Caudal lesions:
  (a) Pain diagnosed as sciatica is the earliest and most common symptom of caudal lesions
  (b) Lipoidol is very useful in caudal lesions
  (c) Post-operative prognosis of caudal tumour is excellent.

(73) Lipoidol (.54c. gms. of iodine to 1 c.c. of poppy oil) is only to be used to determine the exact location of a spinal tumour prior to its removal rather than for the diagnosis, as it causes root pains and thecal inflammation, unless removed.

(74) Whereas larger proportion of cerebral tumours are non-encapsuled and therefore irremovable, the converse holds good in the case of spinal tumours.

(75) Excluding malignant disease of the bone, 50% of spinal tumours are suitable for surgical measures.

(76) The effects of compression by a spinal tumour are entirely removed by its removal, even after a considerable time.

(77) Remember dumb-bell tumours; otherwise intra-dural part will be left behind to continue the pressure effects after operation.

(78) Intense antisyphilitic treatment should precede operative intervention in cases where Wassermann is positive.

(E) **Anterior poliomyelitis:**

(79) Most common cause of paralysis, wasting or deformity in a child is anterior poliomyelitis

Stages : (1) Invasion
(2) Recovery
(3) Stationary
(4) Deformities

Treat: (1) Physiotherapy
(2) Retentive apparatus:
: Splints, plasters, appliances
(3) Soft structure operations: { Tendons, Fasciæ, Muscles }
(4) Bony arthrodesis
(5) Amputations.

(80) Wasting of a limb or talipes in a child:
: ? Ant. poliomyelitis or spina bifida occulta

(F) **Deformities of spine:**

(81) Stages of spinal deformities: with treatment
(1) Auto-correction. static: exercises
(2) Homo-correction. soft tissue changes: plasters
(3) No correction: bony changes: appliances.

(82) Most common causes of scoliosis:
(*a*) Static
(*b*) Compensatory
(*c*) Paralytic.

(83) Scoliosis: clinical picture & treatment types
: Posterior prominence of costal angles with opposite hip
: Treatment types:
(1) Postural: remedial exercises
(2) Structural:
(*a*) Gymnastics
(*b*) Brace or corset
Ind: paralytic deformity

(c) Passive stretching and plaster
(d) Hibbs' fixation:
Ind: (a) Progressive deformity & pain
(β) Paralytic cases not controlled by brace.

(84) Most common causes of kyphosis:
(a) Static
(b) Tuberculosis.
(c) Rickets and osteomalacia

(85) Angular spinal deformity:
(a) Pott's disease
(b) Compression fracture
(c) Kummell's disease
(d) Disc prolapse: Scheuermann
(e) Secondary carcinoma
(f) Wedge vertebra

(G) Painful back:

(86) Chief causes of low backache:
(1) Mal-positions of uterus
(2) Bony lesions
(3) Joint lesions
(4) Intervertebral disc lesions
(5) Muscular and ligamentous lesions.

(87) Treatment of backache:
(1) Correction of posture
(2) Rest in bed with heat and counter-irritants
(3) Manipulations under anæsthesia
(4) [illegible]
(5) [illegible]
(6) [illegible]
(7) Operations: (a) Fasciotomy of Ober
(b) Spinal fusion of Hibbs.

(88) Faulty posture is the primary cause of most cases of *chronic backache and sciatica.*

(89) Intervertebral foramen between 5L and 1S is the smallest of the series, but it has to transmit one of the biggest nerves. Any asymmetry of the lumbar articular processes or other anomalies of the 5L may cause pressure or inflammation of the nerve root.

(90) Anomalies of 5L:
(a) Sacralisation
(b) Spina bifida
(c) Spondylolisthesis: (α) Anterior
(β) Posterior.

(91) Sacro-iliac joints should be radiographed in every case of fibrositis in a young adult male with a history of recurring attacks.

(H) Laminectomy:

(92) Main indication of laminectomy is relief of spinal compression from:
- (a) Trauma
- (b) Inflammation
- (c) Tumour.

(93) Always remember that the spinal segments are at a higher level than the corresponding vertebræ.

(94) In laminectomy for excision of the spinal tumours, the lowest lamina to be removed should be at the level of the highest root involved.

(95) In posterior rhizotomy for pain or spasticity:
Save: (1) 7C and 2D
or (2) 6C and 1D
and (3) 4L.

(96) Causalgic pains, in early stages, are cured by injecting alcohol high up in the peripheral sensory nerve trunk.

(97) In root lesions, Forster operation is better.

(98) In Spiller's antero-lateral tract division, divide the tract on the side of the body opposite to which the pain is situated, between the dentate ligament and anterior nerve-roots origin and never go deeper than 2 mm., to avoid permanent paralysis of the lower limb on the same side due to injury to the pyramidal tract.

(99) Except in the cervical region, simple laminectomy is not followed by any weakness of the spinal column.

(100) Lumbar puncture is dangerous in high intracranial tension.

(101) Take great care that the patient does not give a sudden jerk with the lumbar puncture needle in the spine.

(102) Places for c. s. f. puncture:
- (a) Lumbar: between 3L and 4L vert.
- (b) Cistern: midline, above the axial spine
- (c) Ventricular: 3 cms. above and behind ext. aud. meatus.

CHAPTER III

SYMPATHETIC NERVOUS SYSTEM

(I) ANATOMY:

: *(See pages 857 & 858 for Tables)*

(II) PHYSIOLOGY:

(1) Sympathetic nervous system:

Functions: **Emotional and physiological emergencies:**

(A) Circulatory:
- (*a*) Heart acceleration
- (*b*) Vaso-constriction
- (*c*) Rise in blood-pressure

(B) Oxygenation:
- (*a*) Inhibition of bronchioles: (dilators)
- (*b*) Contraction of spleen

(C) Secretory:
- (*a*) Adrenal stimulant
- (*b*) Thyroid stimulant
- (*c*) Liver stimulant

(D) Other:
- (*a*) Exophthalmos and dilatation of pupil
- (*b*) Pilomotor
- (*c*) Sweat secretory
- (*d*) Muscle tonus

(E) Visceral inhibition:
- (*a*) Inhibition of intestinal peristalsis
- (*b*) Inhibition of micturition.
  - (α) Inhibition of detrusor
  - (β) Spasm of sphincter

(2) *Parasympathetic nervous system:*

Function: **Body conservation:**
- (*a*) Digestion
- (*b*) *Absorption*
- (*c*) Excretion

(A) Vasoconstrictor mechanism:

: *Vasoconstrictors of the* bloodvessels of the limb are supplied by sympathetic fibres which leave the main somatic nerves at various levels and join the tunica adventitia at intervals throughout the entire length of the vessels:

- (*a*) Sympathetic impulses
- ↓ (*b*) Histamine reaction
- ↓ (*c*) Capillary vasoconstriction

[*Contd. on p. 859*

Sympathetic chain

Connector	*Pre ganglion*	*Ganglion*	*Post ganglion*	*Final distribution*	*Functions*
Thoracic: : 1st and 2nd	Cervical sympathetic	Sup. cervical		(*a*) Eye .. (*b*) Blood-vessels ... (*c*) Salivary glands (*d*) Sweat glands	Dilator Constrictor Secretory
Thoracic: : 2nd, 3rd and 4th	White rami	(*a*) Stellate (*b*) Inf. cervical		(*a*) Heart . (*b*) Respiratory tract ..	Accelerator Inhibitory
Thoracic: : 4th to 10th	White rami	Stellate	Along blood-vessels	Upper extremity	(*a*) Vasoconstrictor (*b*) Sweat (*c*) Pilomotor (*d*) Muscle tone
Thoracic: : 5th to 12th	(*a*) Major splanchnic (*b*) Minor splanchnic (Through dorsal symp. ganglia)	(*a*) Cœliac (*b*) Sup. mesenteric	Along blood-vessels to	(*a*) Œsophagus (*b*) Proximal colon (*c*) Liver (*d*) Pancreas (*e*) Adrenals, kidneys	(*a*) Vasoconstrictor (*b*) Motor to sphincters (*c*) Peristaltic inhibitor
Lumbar: : 1st to 3rd	White rami (Through lumbar symp. ganglia)	Inf. mesenteric	Through: (*a*) Hypogastric plex. (*b*) Pelvic plex. Pre-sacral nerve	(*a*) Distal colon and rectum (*b*) Bladder & ureters (*c*) Sexual organs	(*a*) Peristaltic inhibitor (*b*) Motor to sphincters
Thoracic: 10-12 Lumbar: 1—3	White rami	Lumbar 2, 3, 4	Along blood-vessels	Lower extremity	Vasoconstrictor

Connector	*Pre-ganglion*	*Ganglion*	*Post-ganglion*	*Functions*
(A) Cranial parasympathetic. (1) Mid brain	Oculomotor	Ciliary	Pupil	Contraction
(2) Medulla	(A) Facial	(*a*) Spheno-palatine (*b*) Submaxillary	(*a*) Lacrymal glands (*b*) Nasal & palatal glds. (*c*) Submaxillary gls. (*d*) Sublingual glds.	Secretory
	(B) Glossopharyngeal	Otic	(*a*) Mouth (*b*) Parotid	Secretory
	(C) Vagus	(*a*) Heart (*b*) Larynx, trachea, bronchi (*c*) Œsophagus to proximal colon (*d*) Liver and pancreas		Inhibitory (*a*) Motor to peristalsis (*b*) Inhibitory to sphincters (*c*) Secretory
(B) Sacral parasympathetic: Sacral: 2nd, 3rd, 4th	Pelvic splanchnic	Pelvic plexuses	(*a*) Distal half of colon and rectum (*b*) Ureters & bladder (*c*) Sexual organs and external genitals (Nervi erigents)	(*a*) Motor to peristalsis (*b*) Inhibitory to sphincters Excitor

(B) **Skeletal muscles :**
: Control of muscle fatigue

(C) **Intestinal musculature :**

(1) **Motor :**
(*a*) Internal control : (α) Auerbach
(β) Meissner
(*b*) External control : (α) Sympathetic :
: Inhibition
(β) Parasympathetic :
: *Motor*

(2) **Sensory :**
: The only adequate stimulus to cause sensation in hollow viscera, is tension.
(*a*) Pain
(*b*) Hyperalgesia : (α) Superficial
(β) Deep
(*c*) Muscle spasm
(*d*) Glandular activity
: are all referred to parietal segmental associates

(D) **Relation to endocrine system :**
(1) Thyroid · sensitisor of sympathetic system
(2) Adrenal medulla :
(*a*) Brain-stem control centre
↓ (*b*) Splanchnic nerves
↓ (*c*) Connector fibres
↓ (*d*) Excitor cells in medulla
↓ (*e*) Adrenaline
↓ (*f*) Absorption *into the blood*
↓ (*g*) Action on the junctional tissues
↓ (*h*) Sympathetico-mimetic action

(E) **Chemical products in sympathetic and para-symp. :**
(1) **Thyroxin :** From thyroid
(2) **Adrenalin :** From adrenals
(3) **Sympathin :** From sympathetic nerve terminals
(4) **Acetyl choline :** From parasympathetic terminals

(III) DISEASES AMENABLE TO SYMPATHECTOMY :

(I) BLOOD-VESSELS :

(A) *Extremities :*
(1) **Raynaud**
(2) **Thrombo-angiitis obliterans**
(3) **Vasomotor neuroses :**
(α) Upper limb :
(*a*) Acrocyanosis
(*b*) Pneumatic hammer disease
(*c*) Sclerodermia and sclerodactyly

(*d*) Cervical rib
(*e*) Crutch pressure
(β) Lower limb:
(*a*) Erythromelalgia
(*b*) Erythrocyanosis crurum
(4) **Heterogenous group:**
: (Betterment of vascularity)
(*a*) **Chronic ulcers**
(*b*) **Gangrene**
(*c*) **Poliomyelitis**
(*d*) **Chronic arthritis**
(*e*) **Traumatic osteoporosis**
(*f*) **Arterial obliterations**
(*g*) **Volkmann's contracture**

(B) *Head:*
(1) **Eye:** Retinitis pigmentosa
(2) **Ear:**
(*a*) Meniere's disease
(*b*) Deafness
(*c*) Vertigo
(3) **Cerebral lesions:**
(*a*) Epilepsy
(*b*) Mental deficiency
(*c*) Post-encephalitic states
(*d*) Cerebral paralysis
(4) Migraine and chronic headaches

(C) *Thorax:* **Angina pectoris**

(II) SWEAT GLANDS. **Hyperidrosis**

(III) THE VISCERA:

(A) *Alimentary canal:*
(1) Œsophagus: **Cardiospasm**
(2) Stomach: **Peptic ulcer**
(3) Colon: (*a*) **Hirschsprung**
(*b*) Obstinate constipation

(B) *Urinary tract:*
(1) Kidney: renal sympathetico-tonus
(2) Bladder: cord-bladder

(C) *Thorax:* Asthma

(IV) AFFERENT NERVE PATHWAYS:

(A) Head: neuralgias
(B) Viscera: **Inoperable neoplasms**
(C) Extremities:
(*a*) Causalgia
(*b*) Painful stumps
(*c*) Painful ulcers
(*d*) Painful gangrene

(V) GYNÆCOLOGICAL DISEASES:

(1) **Dysmenorrhœa**
(2) Menorrhagia
(3) **Dyspareunia**
(4) Pelvic neuralgia
(5) **Inoperable carcinomata**
(6) Vaginismus
(7) Kraurosis vulvæ
(8) Sexual neuroses

(VI) KINETIC SYSTEM:

(1) Neuro-circulatory asthenia
(2) Essential hypertension
(3) Hyper-thyroidism
(4) Diabetes: associated with hyper-thyroidism
(5) Epilepsy
(6) Peptic ulcer

(I) SYMPATHETIC BLOOD-VESSEL DISEASES:

(A) EXTREMITIES:

(1) RAYNAUD · (See under Blood-vessels).

Indications for sympathectomy:

Before. (*a*) Scleroderma
(*b*) Ulceration
(*c*) Absorption of phalanges

Treatment grades of Raynaud's disease:

(*a*) **Raynaud's phenomenon:**
: Cyanosis on exposure
. Sympathectomy unnecessary

(*b*) **Raynaud's disease:**

(α) **Colour stage:**
(1) Slate colour with numbness
↓ (2) Bright-red colour with burning
· Sympathectomy good

(β) **Ulcerative stage:**
: Sympathectomy a chance

(γ) **Sclerodermic stage:**
: Sympathectomy useless

Treat: **Sympathectomy:**

(A) *Upper extremity:*
(1) · Cervico-thoracic + 2nd thoracic ganglionectomy
(2) **Resection of 2"–3" of sympathetic trunk below stellate** ganglion, which is preserved.

(B) *Lower extremity:*
: **2nd+3rd+4th lumbar ganglionectomy**

(2) THROMBO-ANGIITIS OBLITERANS:
: BUERGER'S DISEASE
(See under Blood-vessels)

(A) **Proximal type: Calf**
Path: **Proximal arterial affection**
Clinic: (*a*) Intermittent claudication of calf muscles
(*b*) Cold extremities
(*c*) Postural colour changes
(*d*) **Absence of main arterial pulse:**
: (Popliteal)
Treat: **Amputation**
· (Sympathectomy no good)

(*B*) ***Distal type: Toes***
Path: **Peripheral vessel affection**
Clinic: (*a*) Coldness and numbness of toes
(*b*) Severe pain in toes and foot at rest
(*c*) Ulceration and gangrene of toes
(*d*) **Presence of main arterial pulse:**
. (Popliteal)
Treat. **Sympathectomy:** Lumbar ganglionectomy
Ind: (*a*) Distal type
(*b*) Early cases with not much of sclerosis
(*c*) Mild trophic changes

(3) VASOMOTOR NEUROSES:

(*a*) **Acryocyanosis:**
Etio. Young women; cold season
Clinic: Cyanotic swelling and chilblains of fingers, hand and forearm
Treat: Stellate ganglionectomy

(*b*) **Pneumatic hammer disease:**
. Raynaud's disease in labourers using pneumatic drill

(*c*) **Scleroderma and sclerodactyly:**
Treat: Cervico-thoracic or stellate ganglionectomy

(*d*) **Cervical rib:**
Path: Raynaud syndrome due to pressure on the lower trunk of brachial plexus

(*e*) **Erythromelalgia:**
Def: Hyperæmic stage of Raynaud's disease
Site: Foot
Etio: Men
Clinic: Hot, red, swollen sole with burning pain

(*f*) **Erythrocyanosis crurum or frigida:**
Syn: Bazin's disease (See page 22)

Etio: Fat legs of adolescent women, esp. jewesses
Path: Of chilblain
Clinic: Cold legs and ankles: with
(*a*) Blue, swollen, indurated patches
↓ (*b*) Shallow ulcers
Treat: (1) Blotchy skin: sympathectomy good
(2) Thick ankles: sympathectomy no good

(4) HETEROGENOUS GROUP:
: **(Betterment of vascularity)**

(*a*) **Chronic or trophic ulcers:**
Treat: Periarterial sympathectomy:
Ind: Temporary betterment of circulation
↓ Healing

(*b*) **Gangrene:**
Varieties: (1) **Arterio-sclerotic:**
Treat: Periarterial sympathectomy.
Ind: (*a*) Preliminary to amputation
(*b*) Promotion of separation and healing

(2) **Diabetic:**
: (*a*) Non-healing chronic ulcers
: (*b*) Gangrene
Treat: Periarterial sympathectomy:
Ind: (*a*) Preliminary to amputation
(*b*) Promotion of separation and healing

(*c*) **Anterior poliomyelitis:**
Treat: Appropriate ganglionectomy
Ind: Wasted cold blue limb with trophic ulcers and chilblain: (Not severe)

(*d*) **Chronic arthritis:**
. Rheumatoid, osteoarthritis
Treat: Upper or lower ganglionectomy:
Ind: (*a*) Absence of primary septic focus
(*b*) Failure of conservatism
(*c*) Response to sympathetic tests
(*d*) Only periarticular & synovial changes
(*e*) Small joints
Contraind: Large joints with bony changes
Results: (*a*) Better circulation
↓ (*b*) Absorption of calcification

(*e*) **Traumatic osteoporosis:**
Etio: Crushing injuries
Sites: Hand or foot
Clinic: (*a*) Œdema, cyanosis and coldness

(*b*) Rarefied bones
(*c*) Arthritis
Treat: Appropriate ganglionectomy

(*f*) **Arterial obliterations:**
Clinic. (1) Signs of stopped circulation
(2) Signs of sympathetic stimulation:
(*a*) Vasospasm
(*b*) Cyanosis
(*c*) Pain and trophic changes
Treat: Resection of obliterated part of the artery:
: (*Indirect periarterial sympathectomy*)

(*g*) **Volkmann's contracture:**
: (See under Muscles)
Treat (*a*) *Periarterial sympathectomy:*
. (Brachial art.)
or (*b*) Resection of thrombosed part of brachial:
Ind: Within 48 hours of onset

(B) HEAD:

(*a*) **Retinitis pigmentosa:**
Def: *Pigmentary degeneration of retina*:
: Due to vasospasm of retinal vessels
Path: Vaso-constriction
↓ Deficient blood supply
↓ Retinal degeneration: peripheral → central
Clinic. (*a*) Night blindness
↓ (*b*) Contraction of visual field
↓ (*c*) Loss of visual acuity
↓ (*d*) Total blindness

(*b*) **Ear: Deafness; Meniere's disease; vertigo**
Treat: Stellatectomy

(*c*) **Migrain and chronic headaches:**
Treat: Stellatectomy

(*d*) ***Cerebral lesions:***
(α) Spastic quadriplegia
(β) Post-encephalitis syndrome
(γ) Congenital mental deficiency
(δ) Epilepsy
Treat: (1) Bilateral cervico-dorsal ganglionectomy
(2) Division of thoracic chain between 1st and 2nd

(C) THORAX: **Angina pectoris**
Etio: Educated classes
Path: (*a*) Coronary vasospasm
↓ (*b*) *Ischaemia*
↓ (*c*) Degeneration and fibrosis of vessel walls
↓ (*d*) Myocardial degeneration

Treat: (1) Radical stellatectomy:
Ind: (*a*) No valvular disease
(*b*) No myocardial degeneration
(2) **Paravertebral alcohol injection:**
: (See under Operations)
Ind: Seniles with sclerotic cardiovascular syst.
Compl: Intercostal neuritis
(3) **Total thyroidectomy**

(II) SYMPATHETIC SWEAT GLAND DISEASES:
: HYPERIDROSIS:
Clinic: Moist, clammy hands with dripping sweat
Treat: Excision of the stellate ganglion

(III) SYMPATHETIC DISEASES OF THE VISCERA:
(A) ALIMENTARY TRACT:
(1) **Œsophagus: Cardiospasm:**
(See under Œsophagus)
Def: Hypertrophy, atony and dilatation of the œsophagus with spasm of the cardiac sphincter
Path (*a*) **Sympathetic irritation**
↓ (*b*) Spasm of the sphincter
+ (*c*) Inhibition of œsophageal peristalsis
↓ (*d*) Œsophagitis
↓ (*e*) Fibrosis of the cardia
+ (*f*) Œsophageal atony
Treat: (1) Dilatation: Hurst or gum-elastic bougies
(2) Gastrostomy
↓ Digital dilatation or plastic operation
Ind: Organic stenosis
(3) **Left gastric periarterial sympathectomy:**
Ind: Neuromuscular disturbance
Tech: Excision of left gastric artery from its origin to its termination on the œsophagus and of its gastric branches.
(2) **Stomach: Peptic ulcer**
Treat: (1) Removal of or alcohol injection into:
: Cœliac plexus
+ (2) Jejunostomy
(3) **Colon:**
(*a*) **Hirschsprung's megacolon:** (See under Colon)
Def: Dilatation and hypertrophy of the colon with retention of its contents due to spastic recto-sigmoid sphincter
Etio: **Childhood:** (*a*) 25% before 5 years
(*b*) 50% before 20 years

Males : Females : : 3 : 1
Familial

Path : (*a*) Disturbed balance between sympathetico-parasympathetic nervous control of recto-sigmoid sphincter
↓ (*b*) **Sympathetic hyperaction**
↓ (*c*) **Inhibition of colic peristalsis**
+ (*d*) **Spastic recto-sigmoid sphincter**
↓ (*e*) Hypertrophy and dilatation of colon
+ (*f*) Obstinate constipation

Clinic : (1) Bad constipation + spurious diarrhœa
(2) Severe abdominal distension
(3) Auto-intoxication
(4) **X-Ray : Barium meal and enema**
(*a*) Enormous dilatation
(*b*) Absence of peristalsis
(c) Absence of haustra
(*d*) Stasis
(*e*) Evacuation after spinal

Treat : Sympathectomy
Ind : (*a*) Age : before 5 or 6 years
(*b*) Positive preoperative test :
: **Barium enema**
+ ***Spinal anæsthesia***
↓ **Peristalsis and evacuation**

Operations : (1) **Bilateral division of lumbar splanchnics** (*Telford and Stopford*)
(2) **Perivascular inferior mesenteric sympathectomy** (around the origin of inf. mesent. artery)

Compl : Recurrence : due to
(α) Inadequate removal
(β) Injury to parasympathetic
(γ) *Intramural fibrosis*

(*b*) **Chronic constipation and diverticulitis :**

Treat : (1) **Re-education of bowels :**
: Diet, aperients, exercises, lavages
↓ (2) **Stimulation of parasympathetic :**
: *Course of acetylcholine + prostigmine*
↓ (3) **Sympathectomy**
Ind : Positive preoperative tests :
(A) (*a*) ***Barium meal :***
: With 24 hourly observation

↓ (b) Spinal anæsthesia :
: After stasis of 7 days
or (c) Spinal anæsthesia :
: When head of contents reaches recto-sigmoid sphincter

(B) **Barium enema**
↓ Immediate spinal anæsthesia
(Operations as in Hirschsprung)

(B) URINARY TRACT :

(1) **Renal sympathetico-tonus :**

Def : **Obstructive nephropathy due to** deficient emptying of the pelvis caused by neuro-muscular dysfunction, in the form of **sympathetic hyperfunction.**

Etio : Nervous stress

Path : (a) Sympathetic hyperfunction
↓ (b) Spasm of outlet ring muscles of calyces and pelvi-ureteral sphincter
↓ (c) Hydronephrosis

Clinic : (1) Unilateral renal pain :
: Relieved by hypodermic eserine
(2) Tender costo-vertebral angle
(3) **Renal tumour**
(4) Urine and renal functions normal

Spl. signs : (1) **Response to hypodermic eserine 1/100 gr.**
(2) Pyelography

Stages : (1) **Stage of hyper-irritation :**
(a) Irregular contractions
(b) Delayed emptying
(c) Colicky pains
(d) Eserine response positive
(2) **Stage of exhaustion :**
(a) Diastole
(b) No emptying
(c) Constant pain
(d) Eserine response positive
(3) **Stage of paralysis :**
: Hydronephrosis

Compl : Urinary sepsis

Treat : **Renal sympathectomy :**

Tech : (1) Extra-peritoneal exposure of kidney
(2) Isolation of pedicle
(3) Eserine test : if positive :
(4) Paint the pedicle with 10% carbolic
(5) Adventitiectomy of :
(a) Pedicle vessels : (take care of vein)

(*b*) Uretero-pelvic junction
(*c*) First inch of ureter
Post. compl: Severe lumbar pain

(2) **Hydro-ureter:**
Treat: Presacral neurectomy

(3) **Bladder: Cord bladder**
Def: Retention of urine with or without overflow
Treat: **Presacral neurectomy:** (Sympathectomy)
Result: Unopposed nervi erigents (parasympathetic)
↓ Evacuation of bladder

(C) THORAX:

: Asthma:
Treat: (1) *Excision or alcoholic injection of* **mid-dorsal sympathetic ganglia** supplying the pulmonary plexuses
(2) Resection of **vagi**

(IV) SYMPATHETIC AFFERENT NERVE PATHWAYS:

(A) HEAD:

: Trigeminal neuralgia:
Treat: Excision of stellate ganglion
Ind: Failure of: (*a*) Alcohol injection
(*b*) Sensory root excision

(B) VISCERAL INOPERABLE NEOPLASM PAINS:
: Pelvic
Treat: Presacral neurectomy upto origin of inf. mes. art.

(C) EXTREMITIES:

(1) **Causalgia:**
Path: Sympathetic dysfunction
Clinic: Painful extremity with hot, burning, spasmodic pain in hand or sole with serious, trivial or no apparent primary cause
Treat: (1) **Periarterial sympathectomy**
(2) **Excision of sympathetic ganglia:**
Ind: Disappearance of pain by novocain injection into main nerves or symp. ganglia

(2) **Painful stumps:**
Varieties: (1) Normal sensations of the amputated limb
(2) [illegible]

(B) **Sympathetic syndrome:**
Clinic: Pain + vasospasm + trophic
Treat: (1) Periarterial **sympathectomy:**
: In upper limb
(2) Ganglionectomy:
: In lower limb

(C) Extreme hyperæsthesia of stump:
Path: Ascending neuritis

(V) GYNÆCOLOGICAL SYMPATHECTOMIES:

Ind: (See above)

Treat: (1) Presacral neurectomy
(2) Periarterial sympathectomy

(VI) KINETIC SYSTEM:

Def: Tissues associated with the control of energy exchanges:
(*a*) Sympathetic system
(*b*) Adrenals
(*c*) Thyroid

(1) **Neuro-circulatory asthenia:**

Def: **Sympathetic hyper-irritability:**
: Not due to hyperthyroidism or psychic causes

Clinic: (1) Nervousness
(2) Debility
(3) Tachycardia: heart consciousness

Tests: (1) **Viscero-ocular reflex:**
: Dilatation of pupils on epigastric pressure
(2) **Somagyi reflex:**
: Dilatation of pupils on deep inspiration
(3) **Erben's reflex:**
: Bradycardia on flexure of thighs and trunk

Treat: **Adrenal denervation**

(2) **Essential hypertension:**

Def: **Abnormally high blood pressure,** rising to high peaks under excitement and physical strain

Etio: **Young adults** → 4th decade

Path: Neurogenic endocrine vascular disturbance
? Basophilism

Clinic: (1) **Headaches:** On mental exertions and fatigue
(2) Insomnia, irritability
(3) **High blood pressure**

Clinic types: Of Keith:

(A) **Benign:**
Age: 40–45
Course: 10–15 years
Clinic: (*a*) Intermittent headaches
(*b*) Retinal arterial spasm

(B) **Early malignant:**
Course: 3–4 years
Clinic: (*a*) B. P.: 160–200
(*b*) Retinal:
: Spasm + hæmorrhage + inflammation

(C) **Malignant:**
Course: 18 months
Clinic: (a) B. P.: 160–300
(b) Severe retinal changes
(c) Cardio-vascular changes
(d) Renal changes
Compl: (1) **Cardio-vascular**
(2) **Renal**
(3) **Arterio-sclerosis**
Treat: (1) Adrenal denervation
(2) **Adson**: Division of major and minor splanchnics
+ Excision of 1st and 2nd lumbar ganglia
+ Excision of outer 2/5th of suprarenal
Ind: (a) Recent disease in young people
(b) No retinal changes
(c) No renal or cardio-vascular changes
(d) Rest and vaso-dilators effective
(e) Positive tests:
(α) Exaggerated cold stimulus response:
: Rise in B. P.
(β) Spinal anæsthesia response:
: Fall in B. P
Contraind: (a) Complications
(b) General unsuitability
Routes: (a) Supra-diaphragmatic (Peet)
(b) Sub-diaphragmatic (Adson)

(3) Hyperthryroidism:
Treat: (1) Thyroidectomy
(2) Adrenal denervation·
Ind. (a) Recurrent hyperthyroidism
(b) Residual hyperthyroidism.
: After thyroidectomy
(4) Diabetes:
(A) Associated with hyper-thyroidism:
Treat: (1) Thyroidectomy: 55% of cures
(2) Adrenal denervation: rest of the cures
(B) Diabetes mellitus:
: *Adrenal operation not indicated*
(5) Epilepsy: 30% benefits by adrenal denervation
(6) Peptic ulcer: ? Adrenal denervation

(IV) INDICATIONS FOR SYMPATHECTOMY:

(1) VASO-SPASTIC CIRCULATORY DISEASES:

: **Spasm > Sclerosis**
: ***Indicative tests:***

(A) POSTURAL TESTS:
(1) **Ordinary postural test:**
(a) Normal: good colour at 180° elevation

- (*b*) Occlusion : pallor at 135° elevation
- (*c*) Bad occlusion : pallor at 70° elevation

(2) **Buerger's postural test :**
: Angle of circulatory efficiency
- (*a*) Leg raised from 40° to 90° : ischæmia
- (*b*) Leg lowered 65°—90° : rubor
- (*c*) Angle of circulatory efficiency :
  - (α) Raise the leg to vertical, till pallor is stationary
  - (β) Lower the leg gradually
  - (γ) Note the angle at which normal pink colour returns

  (Angle of circulatory efficiency is 30° below the horizontal in Buerger's disease)

(B) THERMAL TESTS :

(1) **Protein shock :**
: **Intravenous** injection of 50–70 millions of dead typhoid bacilli (T.A.B. vaccine)

(2) **Sympathetic block :**
Tech : (A) **Peripheral nerve block :**
: Intraneural injection into a peripheral nerve of 5 c.c. of 2% novocain
- (B) **Spinal anæsthesia**
- (C) **P**[illegible]
  - (*[illegible]*
    - ↓ Thoracic sympathetic
    - ↓ Thoracic ganglia 1–2
    - ↓ Brachial plexus
  - (*b*) *Lower extremity :*
    : **Thoracic 8–12 + Lumbar 1–2**
    - ↓ Lumbar chain
    - ↓ Lumbar ganglia
    - ↓ Lumbar + sacral plexuses
- (D) **Splanchnic block**

(3) **Environmental heat :**
Tech : (*a*) Naked patient in a room of 77° F. :
: For one hour
- (*b*) Take temp. of symmetrical points
- (*c*) Cover with three woollen blankets
- (*d*) Repeat (*b*)

(4) **Hot air bath :**
- (*a*) Normal : immediate sharp thermal rise
- (*b*) Spasm : delayed but abrupt and high rise
- (*c*) Occlusion : no rise

Before & after special tests, take the temperatures of:

(1) Mouth
(2) Affected limb
(3) *Sound limb*
(4) Symmetrical points on the body

(A) **Vascular index** $= \frac{\text{Rise in affected limb}}{\text{Rise in mouth}}$

(B) **Vasomotor index** $= \frac{\text{Skin rise} - \text{mouth rise}}{\text{mouth rise}}$

(C) **Direct index** $= \frac{\text{Rise in affected limb}}{\text{Rise in normal opposite limb}}$

Thermal indications for sympathetic interference:

(1) **Higher vascular index**
(2) **Vasomotor index more than 1·5**
(3) **Higher direct index**
(4) Much rise in skin temperature: $> 5°-6°$
(5) ***Temperature of affected limb equals to that of normal:***

Normal	*Before*	*After*	*Rise*
Affected:	x–3	y	y–(x–3)
Non-affected:	x	y	y–x

(6) **Temp. gradiant abolished after spinal**
(7) **Delayed but more abrupt and higher thermal elevation.**
(8) **The skin temperature in affected limb approximates the normal level after diagnostic novocain block.**

(C) DERMAL TESTS:

(1) **Histamine test:**

: Intradermal injection of ·1c.c. of 1 in 1000 histamine *does not produce a wheal*

(2) **Saline test:**

: Intradermal injection of saline absorbed more rapidly in a vaso constricted limb

(D) FAILURE OF MEDICAL TREATMENT:

: Medical treatment of vasospasm:

Ind: (*a*) Very mild cases with circulatory compensation
(*b*) *Responding cases*
(*c*) Non-progressive cases
(*d*) Pre and post operative

(1) General treatment:
- (1) Postural: Rest with protection from exposure
- (2) Diet: Avoid tobacco and alcohol
- (3) Treat the primary cause if any
- (4) Injections:
  - (*a*) T.A.B. or Typhoid H antigen:
    : Intravenous 25–75 million every week
  - (*b*) Padutin: (Bayer) (Pancreatic extract)
    - (α) Intramuscular: ½–2 units B.D.
    - (β) Oral: 9–12 units T.D.S.

  Ind: Peripheral vessels
  - (*c*) Lacarnol: (Heart muscle extract)

  Ind: Angina; coronary vessels
  - (*d*) Carnacton: (Cavendish Chem. Co.)

  Oral: 10-30 min. T.D.S.
  - (*e*) Hypertonic saline:
    : Intravenous 300 c.cs. of 5%;
    : *Three times a week for one month*

  Ind: To lower blood viscosity

(2) Local treatment:
- (*a*) Heat
- (*b*) Diathermy
- (*c*) Electro-therapeutics
- (*d*) Active and passive exercises
- (*e*) Physiotherapy

(2) PAINFUL CONDITIONS:

(A) Angina pectoris:

Anatomy: Thoracic 1–6
↓ All cervical ganglia
↓ Superior, middle, inferior cardiac nerves
↓ Heart

Treat: (1) **Paravertebral injection of alcohol: T 1-6.**
(2) Stellatectomy

(B) Visceral pain: due to
(1) **Inoperable carcinoma**
(2) **Tabetic crises**

Treat: Paravertebral injection of alcohol

(C) Pelvic pain:

Etio: (1) **Bladder:** (*a*) Inveterate cystitis
(*b*) T. B. cystitis
(*c*) Malignant bladder

(2) **Rectum:** Carcinoma rectum

(3) **Uterus:**
- (*a*) Spasmodic inveterate dysmenorrhœa:
  - (α) Failure of curettage
  - (β) Underdeveloped uterus
  - + (γ) Scanty menstruation

(*b*) Inoperable carcinoma cervix
(4) **Idiopathic pelvic neuralgia**
Treat: **Presacral neurectomy**

(D) **Renal pain:** Due to renal sympathetico-tonus
Treat: **Sympathectomy of renal pedicle**
Ind: Eserine test positive

(E) **Causalgia:**
Treat: (1) Periarterial sympathectomy
(2) **Ganglionectomy**
(3) Posterior root resection: Forster
(4) Antero-lateral tract division: Spiller
Ind: (*a*) Failure of conservatism
(*b*) Presence of vasomotor phenomenon
(*c*) Absence of psycho-neurotic factor

(3) SECRETORY DISTURBANCES:

(A) **Excessive sweating: Hyperidrosis**
(*a*) Face: excision of superior cervical ganglion
(*b*) Hands: stellatectomy
(*c*) Feet: lumbar ganglionectomy

(B) **Parotid fistula:**
Treat · **Avulsion of auriculo-temporal nerve**
Ind: Failure of other methods
Sequela: Deformity due to parotid atrophy

(4) RELIEF OF INVOLUNTARY SPASMS:

(A) ***Hirschsprung and colonic stasis:***
Anatomy: L 1 and 2
↓ *White rami communicans*
↓ L 1 and 2 ganglia
↓ Inferior mesenteric ganglion
↓ Presacral nerve
↓ Colon and rectum
Ind: Rapid evacuation of barium enema after spinal
Object: Relief of sympathetic inhibitory effect on peristalsis
Operations: (1) **Adson:**
: Uni or bi-lateral lumbar ganglionectomy
(2) **Wade:** (*a*) White ramisectomy
\+ (*b*) Lumbar splanchnic resection
\+ (*c*) Lumbar cord section
(3) **Trumble:** Inferior mesenteric neurectomy
(4) **Rankin:**
(*a*) **Inferior mesenteric neurectomy**
\+ (*b*) **Presacral neurectomy**
(5) **Adamson:**
(*a*) *Inferior mesenteric neurectomy*
\+ (*b*) Presacral neurectomy
\+ (*c*) *Lumbar splanchnic resection*

(B) **Retention of urine: Cord bladder**

Etio: (1) Spinal trauma or disease
(2) Nerve diseases

Anatomy: (1) Lumbar sympathetic
↓ Presacral nerve
↓ Micturition inhibitor
(2) Sacral parasympathetic
↓ Nervi erigentes
↓ Micturition stimulator:

Treat: **Presacral neurectomy:**
Object: Relief of spasm of internal sphincter
Ind: (*a*) No total paralysis of nervi erigentes
(*b*) Urinary continence present
(*c*) Renal function good

(C) **Bronchial asthma:**
Treat: Stellatectomy

(D) **Cardiospasm:**
Treat: Resection of coronary or left gastric artery

(E) **Sympathetic hydronephrosis and hydro-ureter:**
Treat: (*a*) Renal pedicle sympathectomy
+(*b*) Presacral neurectomy

(V) PREOPERATIVE INVESTIGATIONS IN SYMPATHETIC OPERATIONS:

(I) **History:** Alcohol, **tobacco, rye bread**
Race, sex, family

(II) **Septic focus**

(III) **Circulatory condition:** Blood pressure
: Peripheral pulses
: Condition of arteries

(IV) **Pathological exam.:**
(*a*) **Blood:** (α) Wassermann or Kahn
(β) Chemical: sugar
(*b*) **Urine:** Sugar

(V) **Special investigations:**
(A) **Peripheral blood-vessels:**
(*a*) **Postural tests:**
(α) Ordinary
(β) Buerger
(*b*) **Thermal tests:**
: Estimation of: (1) Vascular index
(2) Vasomotor index
(3) Direct index
(α) Protein shock
(β) Sympathetic block: by
(1) Peripheral nerve block
(2) Spinal anæsthesia

(3) Paravertebral novocain block
(4) Splanchnic block
(γ) Environmental heat
(δ) Hot air bath
(c) **Dermal tests:**
(α) *Histamine test*
(β) Saline test
(d) **Arteriography:**
: With Thorotrast or Uroselectan B.

(B) **Visceral vascular lesions:**
: Retinoscopy: (a) Before thermal tests
(b) After thermal tests

(C) **Alimentary canal affections:**
: X-Ray: barium meal and enema
(a) Plain
(b) After spinal or paravertebral block

(D) **Renal sympathetico-tonus:**
: X-Ray: of renal pelvis
(a) Plain
(b) After eserine injection
(c) After spinal or paravertebral block

(E) **Sympathetic pain:**
: Effect of paravertebral sympathetic block

(VI) OPERATIONS ON THE SYMPATHETIC SYSTEM:

(1) PERI-ARTERIAL SYMPATHECTOMY:

Tech: (a) Sheath resection
or (b) Alcohol injection
: With or without ligation of the vein

Ind: (1) **Palliative:**
(A) *As an aid to healing of chronic foci:*
(a) Chronic ulcers: varicose
(b) Trophic ulcers: perforating
(c) Leprotic ulcers
(d) Kraurosis vulvæ

(B) *As an aid to separation and healing:*
(a) Senile gangrene
(b) Diabetic gangrene

(C) *Betterment of vascular supply:*
(a) Bones:
(α) Delayed union of fractures
(β) Chronic osteoporosis
(b) Joints: chronic arthritis
(c) Volkmann's contracture

(2) **Preliminary:** *To amputations*
(a) To get a stump as long as possible
(b) To get good healing of the stump end

Sites: (A) **Peripheral:** (a) Brachial: Volkmann
(b) Femoral; gangrene
(B) **Visceral:** (a) Gastric: gastric ulcer
(b) Inf. mesent: Hirschsprung
(c) Renal: sympathetico-tonus

Steps: (1) Local anæsthesia
(2) Exposure of vessel
(3) (A) Adventitiectomy:
(a) Injection of normal saline in adventitia
↓ (b) Resection of sheath and adventitia:
(α) For 6–10 cms.
(β) Down to muscular coat
↓ (c) Mop the artery with 90% alcohol
or (B) Injection of absolute alcohol in adventitia.
(a) 15–20 minims
(b) All round the circumference
(c) In periarterial tissues & under the sheath
\+ (4) Tie the main vein
(5) Closure

Difficulties: (a) Difficult exposure
(b) Injury to the artery
(c) Injury to other structures

Post. treat: (a) Raise the limb
(b) Protect the whole limb with cottonwool
(c) Keep the limb dry

Result: (1) Hot and red limb with stronger pulse
(2) Acceleration of healing process

(2) ALCOHOL INJECTIONS:

(A) **Paravertebral:**

Ind: (1) Angina pectoris
(2) Visceral pain
(3) Asthma
(4) As a pre-operative test before ganglionectomy

Sites: (1) Lumbar:
Puncture: (a) 7 cms. from midline
(b) Opposite first lumbar spinous process
(c) Immediately under last rib
Angle: (a) 45° to the sagittal plane:
: Till vertebral body is touched
↓ (b) Withdrawal and anterior inclination:
: Till vertebral body is slid over
(2) Dorsal:
Puncture: In the intervertebral foramina
: At the innermost end of intervertebral space

Tech: (1) Suction
↓ (2) Injection of 2 c.cs. of 2% novocain

(4) Expose and retract 2nd part of subclavian art.
(5) Separate the pleura from inner aspect of upper three ribs
(6) Identify the ganglion on the neck of first rib
(7) Excise the stellate and 2nd dorsal ganglia

Dangers: Trauma to: (1) Phrenic nerve
(2) Plura: hæmothorax
(3) First and second thoracic nerves:
: Post-operative neuralgia
: Arm paresis
(4) Subclavian artery
(5) Vertebral artery
(6) Thoracic duct

Sequela. Horner's syndrome

Preventive: Telford-Gask operation (Med. Ann. 1938)
(a) Preserve stellate ganglion
(b) Resect chain 2"—3" and lower down

Advantages. (a) No eye changes
(b) No failures

(B) Lumbar ganglionectomy:

Anatomy. (1) Ganglia L2, 3, 4:
: Ganglionectomy
(2) White rami: Lateral from cord to ganglia
. Ramisectomy
(3) Lumbar splanchnics: Medial from L 1 and 2
Lumbar splanchnicectomy
(4) Presacral nerve. Anterior to L 5 and promontary
: Presacral neurectomy
(5) Inferior mesenteric plexus · Around inf. mes. art.
: Inf. mesenteric sympathectomy
(6) Lumbar cord: Over common iliac artery
. Section of lumbar cord

Indications: (1) **Improvement of circulation:**
(a) Buerger
(b) Unhealing ulcers
(c) Polyarthritis
(d) Anterior poliomyelitis

(2) **Painful conditions:**
: Causalgia

(3) **Secretory conditions:**
: Hyperidrosis of feet

(4) **Relief of spasm:**
(a) Hirschsprung
(b) Obstinate constipation

Tech: (A) Anterior approach: (Transperitoneal)

(1) Spinal anæsthesia
(2) High Trendelenburg
(3) Incision:
: Long left rectus slide 2/3rds below umbilicus
(4) Peritoneal incision
(5) Procedure:
(a) Left side:
(1) Mobilisation of iliac colon by incising peritoneum lateral to it
↓ (2) Elevation of peritoneum medially to expose lumbar vertebræ
(b) Right side:
(1) Incision of peritoneum at the right border of inf. vena cava, or on the outer side of cæcum and ascending colon.
↓ (2) Retraction of inferior vena cava to the left
(6) Identification and excision of sympathetic chain

Difficulties: (1) Mesenteric glands
(2) Lumbar veins

(B) Lumbar approach · (Extraperitoneal)

(1) Spinal anæsthesia
(2) Kidney position
(3) Incision · outer edge of erector spinæ
: from 11 D to iliac crest
↓ along the crest laterally 4"
(4) Muscle cut
(5) Exposure of retroperitoneal tissues
(6) Anterior displacement of peritoneum
(7) Search for the chain:
(a) In front of quadratus lumborum and psoas
(b) Over the sides of vertebral bodies
(c) Below the inferior pole of the kidney

Dangers: Trauma to: (1) Ureter and spermatic vessels
(2) Inferior vena cava
(3) Lumbar veins

(C) *Muscle-splitting*: *extraperitoneal* (Med. Ann. 1939)

Tech: Bigger McBurney

Advantage: No paralytic ileus

Sequelæ of sympathectomy:

(1) Dry skin
(2) Sensitisation of peripheral vessels

Results of ganglionectomy:

(1) Raynaud: 85% cures
(2) Buerger: 85% cures
(3) Poliomyelitis: good

(VII) NEW GROWTHS OF SYMPATHETIC SYSTEM:

(1) **Ganglioneuroma:**

(A) **Innocent:**

Etio: Children

Site: (a) Sympathetic trunk: (α) Abdominal
(β) Neck
(γ) Thorax
(b) Adrenal medulla

Clinic: (a) Lobulated, rounded, varying-sized
(b) Pressure symptoms

(B) **Malignant:**

Site: (a) Retroperitoneal
(b) Posterior mediastinal

Path: (a) Local infiltration
(b) Lymphatic metastases

(2) **Myelinic neuroma:**

Site: (a) Medulla
(b) Cord
(c) Pia mater
(d) Mediastinum

Path. Masses of non-myelinated **nerve fibres**

(3) **Neuro-blastoma:**

Etio: **Young age**

Site. Kidney and adrenals

Origin: Neuro-ectoderm (precursor of sympathetic syst.)

Path. Embryonic ganglion cells

Clinic: (1) Very malignant, large, **retroperitoneal tumour**
(2) Metastases in skull, brain, liver

(VIII) IMPORTANT POINTS

(A) Anatomy and physiology:

(1) Functions of sympathetic:

(1) Stimulator of: (a) Circulatory system
(b) Respiratory system
(c) Glandular system

(2) Inhibitor of: (a) Intestines
(b) Micturition.

(2) Role of the sympathetic:

(1) Limbs: (a) Calibre of vessels: vaso-constriction
(b) Sweat glands: hyperidrosis
(c) Hair: pilomotor
(d) Voluntary muscles: increased tonus

(2) Abdomen: (a) Inhibition of intestinal peristalsis
(b) Inhibition of micturition.

(3) Acts of micturition and defæcation occur under parasympathetic control.

(4) *Mechanism of micturition and defæcation :*
   (A) *Lumbar sympathetic : inhibitory*
   (B) *Sacral parasympathetic : motor.*

(5) Sympathetic is a system of emotional and physiological emergencies. Parasympathetic is a system of body conservation by stimulating digestion, absorption and excretion.

(6) The sympathetic reflex arcs are activated by lower centres which in their turn are activated by bulbar controlling centres, which are themselves dominated by highest diencephalic centre.

(7) Sympathetic cords are channels for the passage of viscero-sensory and viscero-motor nerves supplying the blood-vessels and other organs and the ganglions provide reflex stations for different visceral syndrome.

(8) [illegible]
   (
 + (

Such as: (1) Achalasia cardia
   (2) Infantile pyloric stenosis
   (3) Hirschsprung
   (4) Peritonitic syndrome · ileus.

(9) Nerve-supply to the limb vessels does not run out in a continuous uninterrupted sheath, but reaches the vessels seriatim as reinforcements from peripheral nerves.

(10) Sympathetic system:
   (1) Superficial fibres go along spinal nerves
   (2) Deep fibres go along perivascular plexuses
   (3) Sensory nerves from viscera pass along:
      : Sympathetic nerves
      ↓ White rami communicans
      ↓ Spinal roots
      ↓ Posterior root ganglia.

(11) There is no third neurone present in adrenal gland, the connector fibre arborising around the excitor cells in the medulla.

(12) Adrenalin is a sympathetico-mimetic substance augmenting and prolonging the action of the sympathetic.

(13) Chemical products of the sympathetic and parasympathetic:
   (1) Thyroxin: from thyroid
   (2) Adrenalin: from adrenals
   (3) Sympathin: from sympathetic terminals
   (4) Acetylcholin: from parasympathetic terminals.

(B) Sympathetic circulatory diseases:

(14) When gangrene occurs without evidence of disease in the *main vessels of the limb, sympathectomy is of great* value; but if the gangrene is associated with loss of main pulses in the limb, high amputation is the only procedure.

(15) In arterial diseases:
: When arterial spasm is a complication of structural disease, the improvement following sympathectomy is likely to be short-lived; if organic changes are secondary to prolonged spasm, sympathectomy if done in early stages will have beneficial and lasting results; it should be done within 3 months of the onset of intermittent claudication.

(16) Differential diagnosis between Raynaud and Buerger:
- (1) *Raynaud*: (*a*) *Cyanosis → hyperæmia*
  - (*b*) Normal pulse
  - (*c*) Superficial ungual gangrene
- (2) Buerger: (*a*) Cyanosis
  - (*b*) Weak or obliterated pulse
  - (*c*) Whole digit gangrene.

(17) Sympathetic surgery is useless in:
- (*a*) Diffuse senile arterial disease
- (*b*) Diffuse diabetic arterial disease
- (*c*) Syphilitic arteritis.

(18) Angiospasm in any situation can be relieved and hyperæmia produced by an appropriate sympathectomy.

(19) *Indication for sympathectomy* in any form in any case of gangrene is:
: *Vascular spasm > vascular sclerosis.* More the spasm factor and less the sclerotic factor, more is the success *of sympathetic interruption.*

(20) In every circulatory gangrene there are three factors:
- (*a*) Spasm
- (*b*) Sclerosis
- (*c*) Obstruction.

(21) Tests in sympathetic vascular diseases:
- (1) Postural tests: (*a*) Ordinary
  - (*b*) Buerger's
- (2) *Thermal tests*: (*a*) *Protein shock*
  - (*b*) Sympathetic block:
    - (α) Peripheral nerve
    - (β) Spinal
    - (γ) Paravertebral
    - (δ) Splanchnic
  - (*c*) Environmental heat

(*d*) Hot air bath

To find: (1) Vascular index

(2) Vasomotor index

(3) Direct index

(3) Dermal tests: (*a*) Histamine

(*b*) Saline.

(22) Indications for sympathetic interruption in vascular diseases:

: After sympathetic block:

(*a*) Higher vascular indices

(*b*) Delayed but abrupt and high rise in temp.

(*c*) Temperature of affected limb coming to normal level

(*d*) Abolition of temperature gradient.

(23) Failure to respond (dilate) and therefore to increase the temperature of the skin, is due to:

(*a*) Spastic disease } of peripheral arterioles and

(*b*) Organic disease } capillaries.

(24) Vasomotor centre in the medulla is sensitive to changes in body temperature of from ·01°C to ·04°C. The function of this centre and its vasomotor system is the control of body temperature in response to environmental temperatures, through vaso-constriction and vaso-dilatation of superficial capillaries, which normally are constricted.

(C) Painful sympathetic conditions:

(25) Individual is conscious only of those visceral parts of the body where reservoir is formed and malignancy is common in these visceral reservoirs of whose distension we are normally aware: such as,

(*a*) Stomach

(*b*) Pelvic colon and rectum

(*c*) Bladder

(*d*) Uterus.

(26) Angina pectoris, when not due to valvular or advanced myocardial disease, is a surgical illness requiring:

(*a*) Stellatectomy

or (*b*) Paravertebral block.

(27) Total thyroidectomy relieves the pain of angina pectoris permanently due to reduction of basal metabolic rate leading to diminished work of the heart.

(28) Surgical treatment for angina (sympathectomy) may be dengerous, as it removes the pain which is a sort of warning against overstrain.

(29) Never undertake a re-amputation in painful stump.

(30) Treatment of painful amputation stumps:

(1) Pain in absent limb: high neurectomy

(2) Sympathetic pain: (positive nerve block test)
(a) Periarterial sympathectomy
(b) Ganglionectomy.

(31) Painful amputation stumps of three types:
(1) Bulbous nerve endings: *tenderness on pressure*
Treat: Excision
(2) Phantom limb: sensations from absent limb
Treat: *Ramisection*
(3) Trophic changes + paroxymal pain:
Treat: Sympathectomy.

(32) Paravertebral sympathetic block at appropriate level is a most helpful test in the differentiation of sympathetic and organic pains and gives accurate estimation of advisability or otherwise of sympathetic ganglionectomy.

(33) *Premenstrual pain contraindicates sympathectomy.*

(D) Secretory disturbances:

(34) Hyperidrosis and parotid fistula are the two conditions where sympathectomy is successful.

(E) Involuntary spasms:

(35) In the natural course of the disease, spasmodic phenomena tend to become organic. Spasm of an involuntary muscle eventually leads to local congestion → *lymphocytic infiltration → fibrosis → disappearance of* muscle fibres

(36) General peritoneal irritation of infective origin sets up a major degree of sympathetic excitation, leading to:
(a) Spasm of regional sphincters
(b) Inhibition of intestinal peristalsis
(c) Functional obstruction
: giving rise to: (a) Vomiting
(b) Ileus.

(37) Normal emptying time of renal pelvis is 1c.c. per minute

(F) Other sympathetic diseases:

(38) *In cases of ocular degenerations* (*primary optic atrophy*, choroido-retinitis, retrobulbar neuritis), cervico dorsal ganglionectomy gives good results.

(39) Sympathetic operation must never be *undertaken in the* presence of organic gynæcological lesion as a substitute for causal treatment. It may be used as an adjunct.

(40) Hyperthyroidism is a state where thyroid is very responsive to requirements of metabolism, which makes an excessive demand due to an *upset in the adrenal* sympathetic system.

(G) Indications for sympathectomy:

(41) Main indications for sympathetic interruption are:
- (1) Improvement of circulation:
  : Raynaud and Buerger
- (2) Relief of visceral pain:
  : Pelvic pain; angina pectoris
- (3) Effect on secretion:
  : Hyperidrosis; parotid fistula
- (4) Involuntary muscle tone:
  : Hirschsprung; cord bladder.

(42) Effects of sympathectomy:
- (1) Removal of tonic impulses to unstriped muscles
- (2) Interruption of visceral afferent impulses.

(43) The result, whether of pre or post ganglionic sympathectomy, depends upon the severity of the disease and structural damage already present.

(44) Sympathectomy for lymphatic œdema and elephantiasis has proved to be valueless.

(45) Conditions for sympathectomy:
- (1) Vasospasm tests positive
- (2) Absence of advanced sclerotic factor
- (3) Sympathetic block test positive:
  - (a) Relief of spasm
  - (b) Relief of pain.

(46) Indications for renal sympathectomy:
- (1) Nephralgia: renal pain without clinical tumour
- (2) Small painful hydro-nephrosis
- (3) Essential hæmaturia
- (4) Prevention of reformation of calculi after nephrolithotomy.

(47) Sympathectomy offers the greatest chance of improvement or cure in the vast majority of diseases due to sympathetic dysfunction:
- (1) Forestalls and prevents gangrene
- (2) Allows low amputation
- (3) Relieves pain
- (4) Cures chronic vascular conditions
- (5) Relieves retention of bowels and bladder

(48) Sympathetic interruption in different conditions:
(1) Pelvic carcinoma or intractable neuralgia:
Treat: Presacral neurectomy
(2) Cardiospasm:
Treat: Cœliac or left gastric sympathectomy
(3) [illegible]
Treat [illegible]

(e) Presacral neurectomy

(4) Cord bladder:
Treat: Presacral neurectomy

(5) Peritoneal syndrome: ileus
Treat: (a) Morphia + barbitones
↓ (b) Belladonna + bromides
↓ (c) Acetylcholin + prostigmin

(6) Causalgia:
Treat: Sympathectomy.

(H) Sympathetic operations:

(49) Preganglionic sympathectomy is preferable to post-ganglionic operation.

(50) Excision of 2nd, 3rd and 4th lumbar ganglia with the intervening portion of the lateral sympathetic trunk is a preganglionic sympathectomy for the lower extremity.

(51) Sympathetic cord division should be done:
(1) Above inferior cervical ganglion
Below 2 D. ganglion
(2) Above 2 L ganglion
Below 4 L ganglion.

(52) Procedures at the lumbar ganglionectomy:
(a) Ganglionectomy proper: L 2, 3, 4.
(b) Ramisectomy: white rami (lateral)
(c) Splanchnicectomy: splanchnics (medial)
(d) Presacral neurectomy
(e) Inferior mesenteric sympathectomy
(f) Section of the lumbar cord.

(53) Stellate ganglionectomy gives rise to Horner's syndrome.

(54) Telford-Gask operation is superior to stellatectomy as:
: (a) No eye changes
(b) No failures.

Tech: Resection of 2"–3" of thoracic sympathetic chain below the stellate ganglion, which is preserved.

(55) **Periarterial sympathectomy:**
(a) Should be done in conjunction with vein ligature
(b) In cases which may require ultimate amputation, the operation should be reserved as a preliminary to that step, to get its site as low as possible.
(c) Should never be done as a cure in:
: (α) Raynaud
(β) Buerger
(d) May be done as a palliative measure for the temporary betterment of vascular supply or as a preliminary to amputation.
(e) Effects of periarterial sympathectomy are temporary and do not last for more than 45 days.

(f) Best time for amputation after preliminary periarterial sympathectomy is within a week from that step

(g) Chief indications:

(1) Chronic unhealing foci: ulcers

(2) Vascular gangrenes: for

(α) Speedy separation

(β) Low separation

(γ) Low site of amputation

(δ) Good healing flaps

(3) Betterment of vascular supply: in

(α) Osteoporosis

(β) Chronic arthritis

(γ) Myositis fibrosa.

(I) Results:

(56) Results of various procedures of sympathetic interruption:

(1) Periarterial sympathectomy:

(a) Effect local

(b) Effect temporary

(2) Ganglionectomy:

(a) Effect more extensive than required

(b) Effect permanent

(3) Ramisectomy:

(a) Regeneration possible

(b) Anatomical inconsistency.

(57) Sympathetic control is lost over the following by undermentioned procedures:

(1) Lumbar ganglionectomy.

(a) Colon and rectum

(b) Lower limb

(2) Presacral neurectomy + inf. mesent. sympathectomy:

(a) Colon and rectum

(b) Seminal vesicles + ejaculatory ducts + prostate : (Sterile but potent)

(c) Danger to parasympathetic: : (Constipation)

(3) Perivascular inferior mesenteric sympathectomy: : Colon only.

(58) When operating upon the rectum, presacral neurectomy is performed at the time of preliminary laparotomy, which decreases the incidence of post-operative retention of urine.

THE RESPIRATORY SYSTEM

CHAPTER I

THE ADENOIDS AND THE TONSILS

(I) THE ADENOIDS

ADENOID HYPERPLASIA:

Etio: (1) Congenital
(2) Infancy and **childhood**
(3) **Infection**: (*a*) Local
(*b*) Secondary: (α) Nasal
(β) Sinus
(γ) Ear
(δ) Tonsil
(4) **General lymphatic hyperplasia**

Path: (1) **Inflammation:**
(*a*) **Primary**
(*b*) **Secondary**: to (α) Nasal infection
(β) Sinus infection
(γ) Ear infection
(δ) Tonsil infection
(2) **Hyperplasia:**
(*a*) Primary
(*b*) Associated with enlarged tonsils
(*c*) Generalised lymphoid hyperplasia

Clinic: (*a*) Age
(*b*) **Presence of one of the complications**
(*c*) Associated **enlarged tonsils**
(*d*) Local examination

Compl: (1) **Nasal obstruction:**
Clinic: (*a*) Facies
(*b*) Oral respiration
(*c*) Respiratory distress on exertion
(*d*) Recurrent rhinitis
Sequelæ: (*a*) Facies
(*b*) Mental sluggishness
(*c*) Nocturnal enuresis
(*d*) Retarded growth
(*e*) Deformed chest
(2) **Sinusitis:**
Clinic: Recurrent intractable coryza
(3) **Respiratory tract catarrhs:**
(*a*) Rhinitis
(*b*) Pharyngitis
(*c*) Laryngitis

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- Etio:
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    - (a) Local
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- Path:
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  - (2) Hyperplasia:
    - (a) Primary
    - (b) Associated with enlarged tonsils
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- Clinic:
  - (a) Age
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- Compl:
  - (1) Nasal obstruction:
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      - (d) Retarded growth
      - (e) Deformed chest
  - (2) Sinusitis:
    - Clinic: Recurrent intractable coryza
  - (3) Respiratory tract catarrhs:
    - (a) Rhinitis
    - (b) Pharyngitis
    - (c) Laryngitis

(β) **Pathological:**

Clinic: (*a*) **Local chronic signs:**

- (α) Hypertrophy
- (β) Atrophy
- (γ) Follicular

(*b*) Regional lymphadenitis

(*c*) Distant complications:

- (α) Present
- (β) Absent

(γ) **Latent:** (*a*) No local signs

(*b*) **Regional lymphadenitis**

(*c*) Distant complications:

- (α) Present
- (β) Absent

(δ) **Focal:**

(*a*) No local or regional signs

(*b*) **Distant complications only**

(*b*) **Secondary:** To acute tonsillitis

- (α) **Unresolving:** Acute → subacute
- (β) **Relapsing:** Acute → subacute → acute
- (γ) **Recurrent:** Exacerbations of acute

(B) *Specific.*

(*a*) **Diphtheritic**

(*b*) **Tuberculous**

(*c*) **Syphilitic:** (α) Chancre: unilateral

- (β) Secondary tonsillitis
- (γ) Gumma: unilateral

Diag: Wassermann or Kahn

(IV) TUMOURS:

(1) **Simple:** (*a*) Papilloma

(*b*) Polypi

(*c*) Lymphangioma

(2) **Malignant:**

(*a*) **Sarcoma:**

Path: Lymphosarcoma

Clinic: (α) Rapid unilateral fleshy enlargement

(β) Rapid and big mass of cervical glands

Treat: Deep X-Rays

(*b*) **Carcinoma:**

Path: Squamous

Clinic: (α) Unilateral enlargement

(β) Secondary glands

(*c*) **Endothelioma:** Malignant

(V) TONSILLECTOMY:

Indications:

(1) **Local:**

(A) **Chronic hyperplasia:** Obstruction to respiration

(B) **Tonsillitis:**
- (*a*) Six weeks **after acute tonsillitis**
- (*b*) **Recurrent** tonsillitis
- (*c*) **Chronic** tonsillitis:
  - (α) Pus from crypts by pressure
  - (β) Purplish-red anterior pillar
  - (γ) Enlarged tonsillar lymph gland
  - (δ) Leucocytosis in tonsillar crypts

(C) **After peri or para tonsillar abscess**

(D) **Growths of the tonsil**

(2) **Regional:**
- (A) Recurrent: rhinitis, sinusitis, otitis, pharyngitis
- (B) **Upper cervical adenitis:**
  - (*a*) Acute
  - (*b*) Recurrent
  - (*c*) Chronic
- (C) **Tonsil facies**

(3) **Distant:**
- (*a*) **Arthritis**
- (*b*) Myositis, fibrositis, fascitis: **rheumatism**
- (*c*) **Heart lesions**
- (*d*) **Thyrotoxicosis**
- (*e*) Nephritis
- (*f*) Capricious pyrexia

(4) **General:** Stunted growth

Preoperative preparation:

(1) Treatment of · (*a*) Deficiency diseases: rickets
- (*b*) Mouth sepsis: oral hygiene
- (*c*) Nasopharyngeal sepsis
- (*d*) Respiratory sepsis: vaccines

(2) **Investigations:**
- (*a*) **Blood:**
  - (α) **Coagulation time:** 3–5 minutes
  - (β) **Bleeding time:** 1–3 minutes
  - If prolonged.
  - (1) Calcium: by mouth and injections
  - (2) Sera
  - (3) Vitamine K: Kapilin (Glaxo)
  - (4) Alkalies to neutralise the urine:
    - : One teaspoonful of soda-bi-carb in a glass of water. B. D.
- (*b*) **Heart**
- (*c*) **Lungs**
- (*d*) **Thymus,** lymph glands
- (*e*) **Urine**
- (*f*) **Liver**

(3) **Immediate preoperative treatment:**
- (*a*) Therapy: for three days previous
  - (α) Glucose: oral or intravenous

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(β) **Pathological:**
Clinic: (*a*) **Local chronic signs:**
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(β) Atrophy
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(*b*) Regional lymphadenitis
(*c*) Distant complications:
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(*b*) **Heart**
(*c*) **Lungs**
(*d*) **Thymus**, lymph glands
(*e*) **Urine**
(*f*) **Liver**
(3) **Immediate preoperative treatment:**
(*a*) Therapy: for three days previous
(α) Glucose: oral or intravenous

(β) Calcium: intravenous
(γ) Sera: intramuscular
(*b*) Mild aperient: two days previous
(*c*) Restricted diet: for two days previous
(*d*) Mental reassurance: sedative the night before

Positions during operation:
(1) **Recumbent:** With sand-bags below the shoulders
(2) **Semilateral**
(3) **Sitting**

Anæsthesia:
(1) **Basal anæsthetic:**
(*a*) Nembutal
or (*b*) Avertin
or (*c*) Paraldehyde per rectum:
: (Drachm one per stone of body weight in a few ounces of saline, two hours before operation).
(2) **Inj. atropine:** Half an hour before operation
(3) **Anæsthesia proper:**
(A) **General:**
(*a*) Ethyl chloride } : not in children
(*b*) Chloroform }
(*c*) Ether
(*d*) **C. E. mixture**
(B) **Local:**
(*a*) Local application of 10% cocain + adrenalin
↓ (*b*) Local injection of ·5% novocain
↓ (*c*) Rest for 10 minutes

Special requirements:
(1) Head lamp
(2) Tracheotomy set
(3) Tonsil clamp
(4) Ice

Operations:
(1) **Guillotine method:**
Ind: 'Tumour-tonsil'
(2) **Dissection method:**
Ind: (*a*) Atrophic tonsil
(*b*) Adherent tonsil
(*c*) Buried tonsil
(3) **Other methods:** (*a*) **Diathermy;** (*b*) **Snare**
Ind: (*a*) Quiescent tonsil
(*b*) Septic tonsil
(*c*) Malignant tonsil

Tech:
(1) **Guillotine operation:**
(*a*) Save the uvula
(*b*) Save the faucial pillars

(*c*) Remove the superior pole
(*d*) Remove the inferior pole
: Always **carry the handle right towards the opposite angle of the mouth,** so that the blade lies perfectly parallel to the anterior faucial pillar at the time of driving the handle home.

(2) **Dissection method :**
(*a*) Hold the tonsil by volsellum forceps
(*b*) *Incise the muc. mem. of the superior angle*
(*c*) Tear the muc. mem. attachments all round the tonsil, except at inferior pole
(*d*) Blunt dissection of the tonsil off its bed
(*e*) Tearing or snaring of the isthumus between the tonsil and the tongue
(*f*) Control of hæmorrhage :
(α) Sponge pressure from opposite side
(β) Ligature of bleeding points
(γ) Application of ice : from outside

(3) Diathermy dissection
Ind : Malignancy
Adv : No primary hæmorrhage
Disadvant : (*a*) Difficulty in removing the whole tonsil
(*b*) Post-operative pain
(*c*) Secondary infection with œdema
(*d*) Secondary haemorrhage
(*e*) Scar tissue
Tech : (*a*) Diathermy knife
(*b*) Diathermy knobs : multiple sittings
Ind : Poor operative risks

(4) **Snare :**
Tech : (1) Dissection
↓ (2) Snaring the tonsil

Post-operative management ;

(1) **Position :**
(A) In bed : for 24 hours
: No pillow
: Head low
: On the side
(B) Sitting : after 24 hours
(C) Indoors : for 3 to 5 days

(2) **Diet :** (A) First 72 hours : cold liquids
(B) 4th to 7th day : soft semi-solids

(3) **Pain :** (A) **Aspirin :** (*a*) Locally : insufflation
(*b*) Internally
(B) Anæsthisin powder or novocaine

(4) **Wound :** Spray or gargles : after 24 hours to 10

(5) **Tonics and change of climate:** For three months
(6) Nasal breathing exercises: after first week
(7) Deafness. auditory tube inflation
(8) Voice production and correct phonetics

Post-operative care:

(1) Make sure that no spurter is left unligatured and bleeding, when the patient leaves the operation table
(2) Make sure that no swab is left in
(3) Make sure that the respiratory passages are clear:
: Insert nasal catheter in each nostril
(4) Nurse to be present till anæsthesia wears off
(5) Keep on the tongue forceps till all reflexes return
(6) Mind the vomit till patient comes out of anæsthesia

Post-operative complications:

(1) **Failure or stoppage of respiration:** Chloroform
(2) Sudden collapse: status thymo-lymphaticus
(3) **Hæmorrhage:**

Varieties: (A) Primary: immediate
(B) Reactionary: within 12 to 48 hours
(C) Secondary: 4th to 7th day

Etio: (A) Local: (*a*) Trauma to blood-vessels
(*b*) Acute sepsis
(B) General. long bleeding and coagulation time

Clinic. (A) Local exits:
(*a*) Mouth
(*b*) Nose
(*c*) Vomit
(*d*) Stools
(B) General signs of hæmorrhage

Treat. (A) **General:**
(*a*) Morphia
(*b*) Coagulants
(*c*) Blood transfusion
(B) **Local:**
(*a*) Ice: internally & externally
(*b*) *BIPP gauze with silk anchor*
(*c*) Tonsil clamp
(*d*) Ligature of bleeding points
(*e*) Suture of pillars over a swab

(4) **Trauma:** To faucial pillars, uvula, tongue
(5) **Septicæmia:**
Etio: Tonsillectomy in acute stage
(6) **Lung affections:**
: Bronchitis, broncho-pneumonia, lobar-pneumonia, lung abscess, pulmonary embolism

Causes: (*a*) Aspiration
(*b*) Embolism

(7) Bacteriæmia: endocarditis, rheumatism, nephritis
(8) Otitis media and mastoiditis:
Etio: (a) Tonsillectomy in acute stage
(b) Local anæsthesia
(9) Deep cervical infection:
Etio: Infected local anæsthetic solution
Clinic: (a) Phlegmonous
(b) Septicæmic
(10) **Tonsil and adenoid remnants**
(11) Glottic spasm
(12) Exanthemata

Results of tonsillectomy:
(1) General health: nearly always good
(2) Nose, throat and chest conditions. good
(3) Hearing: good if done early
(4) Aural discharge: good, unless old
(5) Oral respiration: nearly always good, if done early
(6) Enlarged cervical glands: nearly always good

(VI) PERITONSILLAR ABSCESS: Quinsy

Def: Suppurative inflammation of the cellular tissues of the tonsillar bed

Path: (1) Cellulitis
↓ (2) Abscess:
(a) **Peritonsillar**: In **supratonsillar** fossa
(b) **Paratonsillar**: In **lateral** bed
(c) **Parapharyngeal**: Behind **posterior** pillar

Clinic: (1) **General**: Toxæmia
(2) **Reflex**: (a) Dysphagia
(b) Dyspnœa
(c) Trismus
(d) Earache
(3) **Local**:
(A) **Peritonsillar**:
: Fluctuating, acute inflammatory swelling in supratonsillar fossa with **bulging upper end of the anterior faucial pillar**
(B) **Paratonsillar**:
. Prominent, **medially displaced tonsil**, sitting on a cushion of fluctuating pus on its lateral side
(C) **Parapharyngeal**:
(α) No œdema of the palate
(β) Obliteration of recess **behind the posterior pillar**

Compl: (1) **Spontaneous hæmorrhage:**
Cause: Erosion of ascend. pharyng. artery
Clinic: (*a*) Spurious aneurysm in pharyngeal wall
↓ (*b*) Hæmorrhage
Treat: Ligature of external carotid
(2) **Extension:** (*a*) Outwards
(*b*) Downwards
(3) **Laryngeal œdema**

Treat: (A) **Conservative:**
(1) Purge: full dose of calomel
(2) Intramuscular:
(α) **Collosal manganese**
(β) Manganese butyrate
(3) **Sulphonamide** therapy
(4) Hot gargles and fomentations
↓ (B) **Operative:**
Ind: **Localisation:** As shown by,
(*a*) Dysphagia or trismus
(*b*) Diminution of throbbing
(*c*) Œdema . muffled voice
(*d*) **Remittent fever**
(*e*) **Leucocytosis > 16000**

Anæsth: (1) **General:** Ether
Ind: (*a*) Trismus
(*b*) Nervous patient
Position: Supine
+ Neck extension
+ **Face turned to affected side**
Caution: (1) **Tracheotomy set**
(2) **Preserve pharyngeal reflex**
(2) **Regional:**
. 20% solution of cocaine on a pellet of cotton-wool inserted into the nose, in contact with the spheno-palatine ganglion, at the posterior end of the middle turbinal.
(3) **Local:** Carbolic acid paint

Tech: (1) Small **incision:**
By . Strapped scalpel or special knife
At: (*a*) **Most prominent part**
or (*b*) Midway between uvula and last upper molar
or (*c*) Under the arch formed by anterior and posterior faucial pillars
or (*d*) Behind the posterior pillar

↓ (2) **Hilton's method:**
By: (a) Forceps
(b) Finger
Direction: **Directly backwards** for 3 cms.
↓ (3) **Mop out the pus immediately**
After-treat: (a) Allow to sit and spit out blood and pus
(b) Gargles

(VII) IMPORTANT POINTS

(A) **Clinical aspects:**

(1) Clinical types of tonsillitis:
(A) (1) Acute
(2) Recurrent
(3) Chronic
(4) Latent
(B) (1) Obstructive
(2) Inflammatory
(3) Focal: (a) Regional focus
(b) Distant focus.

(2) Unilateral prominence of tonsils:
(1) Peritonsillar abscess
(2) Gumma
(3) Malignancy.

(3) Tonsil-adenoid symptom-complex:
(1) Recurrent nasal catarrh
(2) Ear inflammation
(3) Sinusitis
(4) Cervical adenitis
(5) Facies and chest configuration
(6) Cyanosis complex
(7) Chest diseases
(8) Endocarditis: rheumatism
(9) Thyroid toxæmia
(10) Distant affections

(4) Most certain proof of chronic tonsillitis is the recurrence of acute attacks.

(5) *Every case of enlarged cervical glands. examine the tonsils*
(a) Inflammatory
(b) Specific
(c) Malignant.

(6) In all cases of ulcers or enlargements of the tonsils, take the Wassermann or Kahn.

(7) *Do not forget diphtheria in every case of tonsillitis.*

(B) **Complications:**

(8) Majority of cases of otitis media start with primary fection in the adenoid or tonsil bed.

(9) Repeated cervical adenitis is very suggestive of adenoid or/and tonsil infection.

(10) Sinus infections in childhood are due to stasis of secretions in the nose, secondary to adenoid obstruction.

(11) In every case of chronic cervical adenitis, where T. B. is suspected, examine the tonsils microscopically.

(12) 60% of cases admitted for tonsillectomy carry streptococcus hæmolyticus in the throat.

(C) Indications for operation :

(13) Do adenoidectomy and tonsillectomy in all cases of chronic otitis media and mastoiditis.

(14) *Indications for adenoidectomy & tonsillectomy :*
- (1) *Respiratory obstruction* and its effects :
  - (a) Deformities
  - (b) Cyanosis complex
- (2) *Recurrent respiratory inflammations :*
  - (a) Rhinitis
  - (b) Sinusitis
  - (c) Pharyngitis and retropharyngeal abscess
  - (d) Chest inflammations
- (3) *Chronic otitis media* with its sequelæ
- (4) *Cervical adenitis*
- (5) *Distant complications*

(15) Tonsillectomy is indicated in diphtheria carriers.

(16) If the history shows a definite connection between an attack of tonsillitis and any other distant condition, tonsils should be removed, even if no signs of tonsillitis are present

(17) It is the duty of a surgeon to remove the tonsils which, after a careful examination, are believed to be the source of infection which produces or aggravates pathological lesions, either locally or regionally or generally.

(18) There could be no question that tonsils should be removed if enlarged and mechanically obstructing, or if demonstrably diseased and infected.

(D) Contraindications :

(19) *Never do tonsillectomy in an acute inflammatory stage.* Allow at least six weeks after a severe attack Septicæmia follows tonsillectomy in acute stage

(20) Unless they actually obstruct the airway, removal of uninfected tonsils can do no good.

(21) Avoid tonsillectomy for at least six weeks in a case with recently developed cold or pyrexia.

(22) *Never open a para or peritonsillar abscess before it has localised.*

(E) Anæsthesia:

(23) Ethyl chloride and pure chloroform should never be given alone in children in tonsillectomies.

(24) In every tonsillectomy in children, exclude status thymo-lymphaticus.

(25) *In every tonsillectomy, keep the tracheotomy set ready.*

(26) *Keep the pharyngeal reflexes present* in every throat operation for the prevention of aspiration complications.

(F) Operation:

(27) It is very important to remove the adenoids correctly and completely without injury to the surrounding structures.

(28) Guillotine operation:
- (*a*) Do not exclude: superior and inferior poles
- (*b*) Do not include: (1) Uvula
  - (2) Anterior faucial pillar
  - (3) Tongue
- (*c*) *Guillotine handle to opposite corner of the mouth*
- (*d*) Guillotine blade parallel to anterior faucial pillar with constant thumb pressure over the latter.

(29) After adenoidectomy, palpate the mouths of eustachian tubes; after tonsillectomy, inspect carefully the tonsillar beds.

(30) *No patient should leave the operation table after tonsillectomy until it is certain that all hæmorrhage has stopped.*

(31) Torn veins, cyanosis and straining are responsible for operative bleeding in tonsillectomy; another important cause is incomplete removal of a tonsil.

(32) Throughout tonsillectomy, airway must be kept clear.

(33) *Second tonsil should never be removed until the hæmorrhage from the first tonsillar fossa has been completely arrested.*

(34) Never forget to examine minutely the tonsillar fossæ and the nasopharynx at the close of a tonsillectomy for:
- (*a*) Remnants and tags
- (*b*) Bleeding points.

(35) In peritonsillar abscess:
- (*a*) Always wear a mask
- (*b*) Push the forceps directly backwards
- (c) Allow the patient to bend forwards immediately and spit out the pus and blood.

(36) Important points in tonsil operations:
- (1) Blood and lymphatic system examination
- (2) Tracheotomy set

(3) Wear a mask
(4) Preserve the pharyngeal reflex
(5) Avoid aspiration of pus or blood
(6) Be sure of hæmostasis.

(G) Post-operative:

(37) Post-tonsillectomy care:
(a) Spurters
(b) Swabs
(c) Respiratory obstruction or aspiration.

(38) In every case of tonsillectomy, keep a close watch on:
(a) Respirations
(b) Expectoration: blood
(c) Vomit. bleeding or aspiration
(d) Stools: altered blood
(e) General condition: restlessness
pallor
pulse.

(39) In every tonsillectomy, tell the relatives or the nurse to expect hæmatemesis after recovery from the anæsthesia.

(40) Brighter and same or more the successive quantities of blood in hæmorrhage after a tonsillectomy, more important it becomes to treat the cause.

(41) Steps to arrest bleeding must be active when:
(a) Blood is brighter
(b) Same or increasing successive quantities
(c) No decline in frequency or decline in frequency replaced by bulky hæmatemesis
(d) General signs of hæmorrhage getting worse.

(42) Pulmonary sequelæ of tonsillectomy in children:
(1) Pneumonia
(2) Lung abscess
(3) Aspiration of foreign body.

(H) Miscellaneous:

(43) If a new born babe is not breathing well, pass a well lubricated nasal catheter into the pharynx.

(44) In case of juvenile asthma, examine:
(a) Tonsils
(b) Adenoids
(c) Nasopharynx.

(45) *Every case of stomatitis, tonsillitis or pharyngitis in a child: Suspect diphtheria.*

(46) There seems to be no certain means of distinguishing microscopically the tonsil of a healthy subject from the tonsil of a patient liable to attacks of tonsillitis or of its complications.

(47) Nothing gives a surgeon greater confidence than the knowledge that he can cope with any bleeding, at any time and in any place, with a cool head.

(48) Tonsillar infection and sore throat may be due to infection from above :
Sore throat : ? Tonsillitis
? Sinusitis
? Otitis media

CHAPTER II

PHARYNX, LARYNX AND TRACHEA

(I) PHARYNX

(I) CONGENITAL:

: **Diverticulum of the pharynx:**

: Blind internal branchial fistula opening into the pharynx behind the tonsil (fossa of Rosenmuller)

(II) TRAUMA:

(1) WOUNDS:

Etio: Incised wounds above the hyoid: suicidal

Clinic. Escape of (a) Air
(b) **Saliva**
(c) Water or food

Compl: Cervical cellulitis

Treat: (1) Suture
↓ (2) Drainage of the superficial tissues
↓ (3) Tubal feeding

(2) HÆMORRHAGE:

Etio. (1) **Trauma**
(2) **Secondary** to (a) Quinsy
(b) Malignancy

Source: (1) Tonsillar branch of descending palatine
(2) Tonsillar branch of dorsalis linguæ

Treat: (A) **Moderate:**
(1) **Gauze pack: turpentine**
+ (2) 20 c.c. coagulen intramuscular
↓ (3)
↓ (4)
(5)

(B) **Severe:**
(1) Internal gauze pack
+ External pressure against jaw ramus
+ (2) Blood transfusion
↓ (3) **Ligature of ext. carotid:**
: With ascending pharyngeal art.

(III) INFLAMMATIONS:

(A) ACUTE, SUBACUTE AND CHRONIC PHARYNGITIS:

(1) Primary

(2) Secondary : to (*a*) Nasal and sinus affections
(*b*) Ear affections
(*c*) Tonsil affections
(*d*) Extrapharyngeal causes

(B) ABSCESSES OF THE PHARYNX:

(1) **Peritonsillar abscess:** (See under Tonsils)
(2) **Parapharyngeal abscess:** (See under Tonsils)
(3) **Retropharyngeal abscess:**

(A) **Acute retropharyngeal abscess:**
Etio: Children: **6 months to 3 years**
Cause: (*a*) **Trauma** with infection: pharyngeal
(*b*) Acute retropharyngeal **lymphadenitis**
Clinic: (1) Very severe **constitutional** signs
(2) **Pharyngeal obstruction:**
(*a*) Dysphagia
(*b*) Dyspnœa: *crowing respiration*
(3) **Reflex signs:**
(*a*) Earache
(*b*) Rigid, retracted neck
(4) **Acute swelling** in the oropharynx
(5) Cervical lymphadenitis
Diff. diag: (1) Acute pharyngitis
(2) Diphtheria
Treat: **Hilton's evacuation in reversed position:**
Stand by: Tracheotomy set
Anæsth: (*a*) Pre-anæsthetic atropine
(*b*) Anæsthetic: (α) Nil
(β) General ethyl chloride
Position: Head hanging down
Tech: (1) Aspiration or small incision
↓ (2) Suction drain or immediate swabbing
↓ (3) Enlarge the opening
After-treat: (1) Trendelenburg position
(2) Mouth toilet with fluid food
(3) Bowel regulation
(4) Watch for dyspnœa
Post. compl: Oedema glottis

(B) **Chronic retropharyngeal abscess:**
Etio: Children: **4 to 16 years**
Causes: (1) **T. B. glands:**
: Between pharynx & prevertebral fascia
(2) **T. B. spine:**
: Behind prevertebral fascia
Clinic: **Slow, fluctuating swelling** behind the pharynx, with fullness behind the sterno-mastoid **in the posterior triangle of the neck.**

Diff. diag: *of pharyngeal malignancy:*

(1) Precancerous epitheliomatosis: Bowen
(2) Quinsy, gumma of the tonsil
(3) Syphilis
(4) Polypi

Treatment of pharyngeal malignancy:

(A) **Preoperative:**
- (1) Antisepsis of the mouth
- (2) Extraction of bad teeth
- (3) Avoidance of ether in diathermy

(B) **Primary growth:**
- (1) **Radium:** Needles or **bomb**
- (2) **Deep X-Rays**
- (3) Diathermy
- (4) Operative: Trotter's transthyroid route
- (5) **Gastrostomy:** Palliative

(C) **Secondary cervical glands:**
- (*a*) **Impalpable:**
  - (α) Prophylactic radiation
  - (β) Close and repeated observation
- (*b*) **Impalpable but infiltrative primary:**
  - : Simultaneous removal of both with prophylactic ligature of ext. carotid art.
- (*c*) **Palpable:**
  - (α) Removal
  - \+ (β) Ligature of external carotid
  - : (10 days before the treatment of primary)

Post-operative complications.

(1) Secondary hæmorrhage
(2) Aspiration pneumonia
(3) Inanition with cachexia

(II) LARYNX

(I) CONGENITAL:

: **Laryngocele:**

Def: Diverticulum of the larynx

Clinic: Painless cystic aerocele on the anterior or lateral aspect of the larynx, moving on deglutition

(II) TRAUMA:

(1) FOREIGN BODIES IN THE LARYNX:

Sites: (*a*) Valecula
(*b*) Sinus pyriformis

Signs: (*a*) History or no history
(*b*) **Acute obstructive dyspnœa or dysphagia**
(*c*) Laryngeal irritation: dry, hacking cough
(*d*) **Lung signs:** obstructive emphysema
- (α) Check valve
- (β) Ball valve

Diff. diag: (1) Acute laryngitis
(2) **Diphtheria**
(3) Laryngeal spasm

Compl: (1) Recurrent attacks of suffocation
(2) **Œdema glottis**
(3) **Lung sepsis:**
(*a*) Purulent bronchitis or bronchiectasis
(*b*) Septic broncho-pneumonia
(*c*) Abscess, gangrene or collapse lung.
(*d*) Empyema

Treat: (1) **Direct laryngoscopy** (with removal of F.B.)
Ind: (*a*) Examination of larynx
(*b*) Removal of impacted foreign body
(*c*) Laryngeal obstruction
Anæsth: (*a*) Dose of atropine
↓ (*b*) Anæsthesia:
(α) Nil: in children under 3
(β) General: ether
(γ) Local (Pantocain 1%)
If severe respiratory distress:
(α) Tracheotomy
↓ (β) General anæsthesia
↓ (γ) Laryngoscopy
After-treat: Watch for œdema glottis
(2) **Urgent tracheotomy**
(3) **Laryngo-fissure**

(2) WOUNDS OF THE AIR PASSAGES:

Etio: (1) Incised wounds:
(*a*) Suicidal: high
(*b*) Homicidal: low
(*c*) Operative

Clinic: (1) Emphysema
(2) Escape of air
(3) Respiratory distress and aphonia

Compl: (1) Suffocation
(2) Lung sepsis
(3) Cervical sepsis
(4) Necrosis of cartilages

Treat: (1) Suture: air-tight
↓ (2) Drainage of surrounding tissues
\+ (3) Tracheotomy

(III) INFLAMMATION:

(A) ACUTE INFLAMMATIONS:

(1) Acute laryngo-tracheo bronchitis:

Path: Descending inflammation of the airways due to infection by streptococcus haemolyticus giving rise to:
(*a*) Inflammatory oedema of glottis

↓ (b) Obstruction to the airways
↓ (c) Atelectasis of the lung
↓ (d) Cardiac and general exhaustion
Treat: (1) Rest: no opiates
(2) Oxygen inhalations
(3) Fluids
(4) Tracheotomy: if necessary
(5) Postural drainage or aspiration or irrigation

(2) **Œdema glottis:**
Def: **Exudation in the submucosa of rima glottis**
Etio: (1) **Inflammatory:**
(a) Burns and **scalds of the pharynx**
(b) **Trauma** and foreign bodies
(c) **Acute cellulitis of mouth and neck**
(2) **Non-inflammatory:**
(a) Local dropsy
(b) Pressure on cervical veins
(c) Carcinoma tongue
(d) Massive doses of pot. iodide
(e) Angio-neurotic œdema
Clinic: **Urgent dyspnœa**
Treat: (1) **Intubation of larynx**
Ind: Temporary
(2) **Laryngotomy**
Ind: Adults
(3) **Tracheotomy:**
Ind: Children

(3) Abscesses of the larynx:
Etio: (1) Traumatic: (α) Lacerations
(β) Foreign bodies
(2) Ulceration of tumours with secondary infection
(3) Secondary: (α) Typhoid
(β) Influenza
(γ) Septicæmia
Path: (1) Œdema
↓ (2) Perichondritis
↓ (3) Osteomyelitis
↓ (4) Abscess
Clinic: (1) Deep pain on pressure and swallowing
(2) Sensation of foreign body
(3) Dyspnœa
(4) Hoarseness
Signs: Local
Treat: (A) Arytenoids: (a) Unilateral: wait
(b) Bilateral:
(α) Tracheotomy
↓ (β) Laryngofissure

↓ (γ) Drainage
↓ (δ) Sequestrotomy
(B) Thyroid cart: Window resection
(C) Cricoid cart : Tracheotomy
↓ Laryngofissure

(4) Infective perichondritis:
Etio: (1) Oral sepsis
(2) General low resistance
Causes: (1) Trauma: (*a*) Incised wounds
(*b*) High tracheotomy
(2) Infective: Typhoid
Clinic: (*a*) Pyrexia
↓ (*b*) Local pain
↓ (*c*) Hoarseness
↓ (*d*) Dysphagia
↓ (*e*) Dyspnœa
↓ (*f*) Tender swelling
+ (*g*) Lymphadenitis
Compl: (1) Stenosis or fixation
(2) Loss of function
(3) Recurrent laryngeal paralysis
Treat: (1) Conservative
↓ (2) Low tracheotomy

(B) CHRONIC AND SPECIFIC INFLAMMATIONS:

(1) Chronic catarrhal laryngitis:
Etio: Orators, **teachers**, preachers
Clinic: (1) Dryness of the pharynx
(2) Tired and **hoarse voice**
Compl: **Contact ulcer:**
: Perichondritis of the tip of the vocal process

(2) Tuberculosis of the larynx:
Etio: Pulmonary tuberculosis
Path: Infection: sputum through the epithelium
Place: vocal process
Clinic: (1) **Hoarse voice:** In a patient with phthisis
↓ (2) **Perichondritis:**
: With perilaryngeal cold abscess
Signs: (1) Isolated redness or swelling on the under surface of a vocal cord
(2) Swelling and redness of:
(*a*) Vocal process
(*b*) **Inter-arytenoid region**
(*c*) Anterior commisure (rare)
(3) Characters of lesions:
(*a*) Numerous
(*b*) Superficial

(c) Mobile cord
(3) **Advanced pulmonary T. B.:**
: **With positive sputum**

Diff. diag: (1) Catarrhal laryngitis
(2) Syphilis of the larynx
(3) Carcinoma larynx

Treat: (1) **Silence**
(2) **Treatment of pulmonary condition**
(3) Light baths
(4) **Alcohol injection** into:
(*a*) **Superior laryngeal nerve**
(*b*) Recurrent laryngeal nerve
(5) Galvano-cautery
(6) Conservative surgery

(3) **Syphilis of the larynx:**

(A) **Secondary:** Laryngitis and mucous patches

(B) **Tertiary:** (1) Gummatous infiltration
↓ (2) Necrosis
↓ (3) Secondary infection
↓ (4) Abscess

(4) **Laryngeal perichondritis and necrosis:**

Etio: (1) **Traumatic**
(2) **Infective:** (*a*) Sepsis
(*b*) Typhoid
(3) **Specific:** (*a*) Tuberculosis
(*b*) Syphilis
(4) **Carcinoma:**
: Ulceration with secondary infection

(IV) NEW GROWTHS:

(A) INNOCENT:

(1) **Papilloma:**

Path: Soft, pedunculated warts on the posterior third of the true or false vocal cords

Clinic: Hoarseness, dyspnœa

Treat: Excision through a laryngoscope

(2) Fibroma
(3) Angioma
(4) Lipoma
(5) Chondroma
(6) Cystoma: (*a*) True laryngeal
(*b*) Cervico-laryngeal: branchial

(B) MALIGNANT:

Carcinoma of the larynx:

Etio: Age and sex: Men of 55

Predisposers: (*a*) Scar tissue
(*b*) Vocal abuse
(*c*) Tobacco: cigarette
(*d*) **Benign growths**

Site: (A) **Intrinsic:**
(1) **Anterior or middle third of vocal cord:**
↓ Anterior commissure
↓ Opposite cord
Path: Squamous celled
Clinic: Hoarseness
(2) **Ventricular band or ventricle:**
Path: Columnar celled
Clinic: Local discomfort
(3) **Subglottic:** Anterior half
(B) **Extrinsic:**
(1) **Epiglottis:** (*a*) Posterior: laryngeal
(*b*) Anterior: lingual
(*c*) Lateral: ary-epiglottic
(2) **Ary-epiglottic fold**
(3) **Pyriform fossa:** (*a*) Floor
(*b*) Lateral wall

Path: (1) **Squamous celled carcinoma: 95%**
(2) Basal celled
(3) Columnar celled: in ventricular site

Clinic: (A) **Intrinsic:**
(1) **Early and pronounced: Huskiness**
↓ Hoarseness
↓ Aphonia
↓ Dyspnœa
↓ (2) **Late glandular metastases**
(B) **Extrinsic:**
(1) **Early and pronounced glands**
↓ (2) **Early dysphagia and late dyspnœa**

Signs: (1) **Laryngoscopy:**
(*a*) Slight immobility of vocal cord
(*b*) Unilateral local congestion
(*c*) Local ulcer
(*d*) Local infiltrating wart
(*e*) Local thickening
(*f*) Nil: (in pyriform growths)
(2) **Œsophagoscopy**
(3) **Biopsy:** (A) **Primary**
(B) Glandular metastas

Diff. diag: (A) **Intrinsic:**

- (1) **Chronic laryngitis**
- (2) **Tuberculosis**
- (3) **Syphilis**
- (4) Innocent tumours
- (5) Keratosis and pachydermia
- (6) Paralysis
- (7) Submucous hæmorrhage

(B) **Extrinsic:**

: All causes of enlargement of cervical glands

Compl: (1) **Chest complications**

(2) **Respiratory obstruction**

Treat: (A) **Intrinsic carcinoma:**

(1) **Excision of the primary:**

(a) **Laryngo-fissure:**

Ind: Early one sided growth:
: With mobile cord

(b) **Partial laryngectomy:**

- (a) Anterior
- (b) Lateral

Ind: (1) Growth across ant. commissure
(2) Growth in the subglottis

(c) **Total laryngectomy:**

Ind: (1) Epiglottic extension
(2) Arytenoidal extension
(3) Subglottic extension
(4) Ventricular extension
(5) Cartilage extension
(6) Fixation of one or both the cords
(7) Recurrence after laryngo-fissure

(2) **Radiation:**

Ind: Total laryngectomy contraindicated

Tech: (a) Deep X-Rays
(b) Radium:
(α) Surface bomb
(β) Interstitial subchondral method

(B) **Extrinsic carcinoma:**

(1) **Epiglottis:**

- (a) Lateral: lat. pharyngotomy & excision
- (b) Posterior: total laryngectomy
- (c) Anterior: excision after mandible-split

(2) **Fossa pyriformis:**

- (a) Laryngo pharyngectomy
- (b) Palliative: (α) Gastrostomy
  (β) Tracheotomy

(C) **Glandular metastases:**
(1) Bilateral excision
(2) Deep X-Ray therapy
(3) Radium: (*a*) **Bomb**
(*b*) Interstitial

(V) PARALYSIS OF THE LARYNX:
Causes: (1) **Goitre:** (*a*) Preoperative: malignancy
(*b*) **Post-operative**
(2) Pulmonary T.B.
(3) Aneurysm
(4) Carcinoma œsophagus
(5) Syphilis
Path: (1) Trauma to, pressure on, or implication of recurrent laryngeal nerve
↓ (2) Vocal cords in: (*a*) Adduction
(*b*) Midway: cadaveric.
Clinic: (1) Dyspnœa
(2) Voice disturbances
Treat: **Tracheotomy:**
Ind: **Bilateral abductor paralysis**

(III) TRACHEA

(I) FOREIGN BODIES IN TRACHEA:
Clinic: (1) History or no history
(2) Recurrent glottic spasms
(3) Anxious expression and immobility
(4) **Dyspnœa** and asthmatoid expiratory wheeze
Sign: **Silent tracheotomy:**
: No air enters or leaves the lungs even during artificial respirations after treacheotomy
Treat: (1) **Bronchoscopy:**
(*a*) Oral
(*b*) Tracheal
(2) *Tracheotomy:*
Explore with: (*a*) Sinus forceps
(*b*) Bronchoscope
Ind: (*a*) Surgeon not always at hand
(*b*) Child under 3 years
(*c*) Transport to a distance

(II) OBSTRUCTION TO THE TRACHEA:
(A) **Extrinsic:**
(1) **Goitre:** (*a*) Non-malignant:
(α) Suprasternal
(β) **Retrosternal**
(*b*) **Malignant**

(2) **Aneurysm**
(3) Œsophageal carcinoma
(4) Enlarged glands
(5) Mediastinal tumours

(B) **Intrinsic:**
(1) **Diphtheria**
(2) **Foreign body**
(3) Syphilis
(4) Tuberculosis
(5) New growths: sarcoma or carcinoma

(III) Carcinoma:
Etio: Late middle life in males
Path Squamous
Clinic: (1) Retrosternal oppression with dyspnœa
(2) Purulent or bloodstained sputum
(3) Dysphagia
Compl · Lung complications
Treat (1) Excision
(2) Radiotherapy

(IV) OPERATIONS ON PHARYNX, LARYNX AND TRACHEA

(I) OPERATIONS ON THE PHARYNX:
PHARYNGOTOMY
Ind: Exposure and treatment of the focus below the level of the palate
Tech: (A) *Median pharyngotomy:*
Ind: Growths of the epiglottis and the base of the tongue
(a) Subhyoid: through the thyrohyoid membrane
Ind: Affections of the epiglottis
Tech: (1) Incision: transverse subhyoid
(2) Division of platysma and prelaryngeal muscles:
: Close to the hyoid
(3) Division of thyrohyoid membrane:
· (Spare the superior laryngeal nerve and vessels)
(4) Exposure of the epiglottis
(b) *Transhyoid: Division of the hyoid*
(c) Suprahyoid:
Ind: Exposure in the region of the base of the tongue
Tech: (1) Transverse suprahyoid incision:
: From sternomastoid to sternomastoid
(2) Retraction of submaxillary gland
(3) Detachment of myelohyoid muscle
(B) *Lateral pharyngotomy:*
Ind: (a) Malignancy of pharynx
+ (b) Cervical gland metastases
(a) Superior lateral pharyngotomy:
Ind: Growths of: (a) Tonsils
(b) Faucial pillars
(c) Base of the tongue

Tech: (1) Division of the mandible in front of masseter
(2) Incision of superior constrictor in front of tonsil

(*b*) Inferior lateral pharyngotomy:

Ind: Growths of: (*a*) Pyriform fossa
(*b*) Larynx
(*c*) Post-cricoid region

Tech: (1) Removal of hyoid cornu and thyroid ala
(2) Division of middle and inferior constrictors

(*c*) *Combined lateral pharyngotomy:*

Syn: Trotter's laryngo-pharyngotomy

Steps: (1) Preliminary tracheotomy: with intratracheal anæsthesia
↓ (2) Laryngo-pharyngotomy:
- (*a*) Incision: (α) Mid-mento-hyoid to ear
  - \+ Along the sternomastoid
  - or (β) Ear to cricoid along sternomastoid
  - \+ Lip to cricoid in midline
- (*b*) Dissection of skin and fascial flaps
- (*c*) Exposure of anterior and submaxillary triangles
- (*d*) Crile's resection of cervical tissues
- (*e*) Division of:
  - (1) Post. belly of digastric and stylohyoid
  - (2) Common facial vein
  - (3) Arteries. (α) Superior thyroid
    - (β) Lingual
    - (γ) Facial
  - (4) Nerves. (α) Superior laryngeal
    - (β) Lingual
    - (γ) Hypoglossal
- (*f*) Suture of sternomastoid to prevertebral muscles
- (*g*) Division of: (α) Thyroid muscles:
    - (1) Inferior constrictor
    - (2) Stylopharyngeus
  - (β) Hyoid muscles:
    - (1) Hyoglossus
    - (2) Sternohyoid
    - (3) Thyrohyoid
    - (4) Middle constrictor
- (*h*) Division of: (α) Mandible
  - (β) Hyoid cornu
  - (γ) *Posterior ⅔rds of thyroid ala*
- (*i*) Packing and isolation of the wound and protection of laryngeal inlet
- (*j*) Incision into the whole lateral wall of the pharynx
- (*k*) *Excision of the tumour*
- (*l*) Closure with drainage: (Pharyngo-cutaneous fistula)

After-treat: (1) Feeding tube into the œsophagus
(2) Tracheotomy tube: for 10 days
(3) Closure of pharyngostome: after 4 weeks

(II) OPERATIONS ON THE LARYNX:

(1) Intubation of larynx:

Ind: Laryngeal obstruction
Advant: Avoids operation
Disadv: Ulcer cord
Anæsth: Spray the nasal passages with 10% cocaine during inspiration
Tech: Introduction of No. 12 catheter with stilette curved into C. via: (*a*) Nose
(*b*) Mouth

(2) Infrathyroid laryngotomy:

Def: Insertion of a tube through an opening in the crico-thyroid membrane
Ind: (A) Only in adults
(B) **Emergency: Sudden laryngeal obstruction:**
(*a*) Foreign body
(*b*) Œdema glottis
(*c*) Spasm glottis
(*d*) Bilateral abductor paralysis
(C) **Preliminary:** To operations on:
(*a*) Tongue
(*b*) Floor of the mouth
(*c*) Jaw
(*d*) Pharynx
Position: Extension of neck with head exactly in mid-line
Tech: (1) Transverse incision over crico-thyroid interval
(2) Push in a dilator through the crico-thyroid membrane and dilate
(3) Introduction of tube and its fixation by tapes
Compl: (1) Apnœa
(2) Hæmorrhage
(3) Emphysema
(4) Chronic ulcer
(5) Stenosis

(3) Laryngo-fissure:

Def: Splitting the larynx and excision or cauterisation of growths on the vocal cords
Ind: (1) Early intrinsic carcinoma with mobile cords
(2) Innocent growths
(3) Foreign bodies
(4) Stenosis
Preoper: (1) Treatment of oral sepsis
(2) *Preliminary deep X-Rays: In malignancy*
(3) Abstinence from alcohol and tobacco
Anæsth: Combined: local + general

Position: Extension neck with head exactly in midline

Tech: (A) Tracheotomy with pharyngeal plug:
- (a) Incision: midline hyoid to suprasternal notch
- (b) Tracheotomy: trans-isthumus
- (c) Tracheal anæsthesia + pharyngeal plug

(B) Exposure of the larynx:
- (a) Exposure of thyroid and cricoid cartilages
- (b) Ligature of sup. laryngeal artery:
  : (On the thyrohyoid membrane)

(C) Exposure of the growth:
- (a) Midline split of thyroid perichond. & crico-thyroid mem.
- (b) Midline split of thyroid cartilage
- (c) Retraction of laryngeal halves

(D) Tracheal plug above the tracheotomy

(E) Excision of the growth:
. Excision of the growth with a healthy margin of 1/4 inch

(F) Closure of the larynx:
- (a) Catgut stitches through the perichondrium
- (b) Sutures upto tracheotomy tube

After-treat: (1) Tracheotomy tube: for 6 to 24 hours
(2) Nasal feeds: for 5 days
(3) Sitting posture
(4) No morphia: Give bromides and aspirin
(5) Use of voice: as early as possible

Post. compl: (1) Hæmorrhage
(2) Emphysema
(3) Respiratory infection
(4) Cervical cellulitis
(5) Mediastinitis
(6) Aphonia
(7) Recurrence

(4) Hemilaryngectomy: (A) Anterior: Tapia
(B) Lateral: Hautant

Ind: Carcinoma larynx limited to one side only

Tech: (1) Hyoid-suprasternum midline incision
(2) Tracheotomy: with intratracheal anæsthesia
(3) Hemilaryngectomy:
- (a) Incision through cartilage on opposite side of the growth
- (b) Midline incision into cricoid
- (c) Removal of the affected parts of cartilages:
  - (α) Thyroid
  - (β) Cricoid

(4) Separation of membranous larynx from cricoid
(5) Removal of: (a) Growth with healthy margins
(b) Vocal process of arytenoid
(c) Small piece of opposite cord

(d) Ventricle
(e) Ventricular band
(6) Closure of the wound

(5) Laryngectomy:
Ind: Advanced intrinsic carcinoma
Preoper: (1) Mouth and dental care
(2) Respiratory prophylaxis: anticatarrhal vaccine
Anæsth: Local + General intratracheal
Position: That of tracheotomy.
Tech: (A) Ascending laryngectomy: Perier
(B) Descending laryngectomy: Gluck
(1) Isolation of larynx and ligature of blood-vessels:
(a) Incision. (α) Transverse sternomastoid to sternomastoid, one inch above the jugulum
(β) Bilateral along the sternomastoids upto hyoid cornu
(γ) Bilateral down and out towards the clavicles
(b) Ligature of veins
(c) Resection of subhyoid muscles
(d) Separation of thyroid isthmus
(e) Ligature of superior thyroid art.
(f) Division of inferior constrictor and stylopharyngeus from the thyroid ala
(g) Ligature of superior laryngeal art. and nerve
(2) Excision of cervical lymph glands.
(a) Glands of Poirier: under thyroid isthumus
(b) Deep cervical: along outer side of int. jug. vein
(3) Separation of larynx from pharynx and oesophagus:
(a) Division of thyrohyoid ligament
(b) Epiglottis drawn out
(c) Separation of larynx from pharynx by dissection of pharyngeal muc. membrane off the posterior wall of the larynx
(d) Passage of No. 12 Jacques catheter through the mouth into the upper end of the œsophagus
(e) Interrupted sutures in the pharynx
(4) Amputation of larynx from trachea and formation of tracheo-cutaneous fistula:
(a) Division of trachea above the isthumus
(b) Anchor the lower end to the lower margin of incision
(c) Ligature of vessels
(d) Skin tracheal sutures
(5) Closure and drainage of the wound:
(a) Interrupted sutures
(b) Drainage tubes: three on each side
(c) Cannula tied in tracheal opening

After-treat: (1) Sitting posture
(2) Frequent dressings
(3) Liquid feeds
(4) Never leave the patient alone for a week.
(5) Tracheal cannula out: after 48 hours
(6) Œsophageal cannula out: after recovery of deglutition
(7) Artificial larynx

Post. compl: (1) Leakage → infection: (a) Cervical cellulitis
(b) Mediastinitis
(2) Aspiration → Pneumonia
(3) Septicæmia
(4) Secondary hæmorrhage: (a) Local
(b) Hæmatemesis
(c) Melæna
(5) Tachycardia: irritation of vagus
(6) Persistent hiccough: irritation of phrenic
(7) Pharyngeal fistula
(8) Tracheitis sicca

(III) OPERATIONS ON THE TRACHEA:

TRACHEOTOMY:

Ind: **Respiratory obstruction down to cervical trachea:**

(1) **Diphtheria:**
(a) Primary
(b) Failure of laryngeal intubation:
(α) Failure of three intubations
(β) Frequent expulsions of tube
(γ) Urgent dyspnœa inspite of tube

(2) **Œdema of the glottis:**
(a) **Traumatic:** Scalds
(b) **Infective:** Cellulitis
(c) Irritative: fumes
(d) Circulatory. venous pressure
(e) Chemical: pot. iodide

(3) **Trauma:**
(a) **Foreign bodies:** Blood
: Coins, beads, etc.
(b) Fracture cartilages
(c) **Cut throat**
(d) Gunshot wounds

(4) **Specific:**
(a) Tuberculous laryngitis
(b) Tertiary syphilis

(5) **New growth:**
(a) Carcinomatous obstruction
(b) Carcinomatous compression

(6) **Nervous:**
(a) Bilateral abductor paralysis
(b) Laryngeal spasm or stridor
(7) **Therapeutic:**
(a) Preliminary to operations on:
(α) Oral cavity
(β) Pharynx and larynx
(γ) Chest
(b) Endotracheal or endobronchial therapeusis

Anæsth: (1) Nil: in children and urgency
(2) **Local:** Novocain infiltration
(3) General: in young children

Position: (1) Extension of the neck:
: Chin and episternum in one plane
(2) **Head exactly in midline**
(3) Sandbag beneath the shoulders

Tubes: (1) Bivalve: (a) Inner
(b) Outer
(2) Durham lobster-tailed
(3) Parker's angulated

Sizes: (a) English: 1 to 8
(b) French: 18 to 32

Ind: (1) Children under 2: Eng. No. 2; Fr. No. 20
(2) 2 to 4 years : Eng. No. 3; Fr. No. 22
(3) Over 4 years : Eng. No. 4; Fr. No. 24
(4) Adults : Eng. No. 5 or 6; Fr. Nos. 26-28.

Tech: (A) Crico-tracheotomy·
Ind: Temporary and urgent measure
Site. Lower border of cricoid
Contraind: Tube not well borne
(B) High supra-isthmus tracheotomy:
Ind: (1) Extreme urgency
(2) Children
(3) Obese short neck
(4) Lower part inaccessible.
Tech: (1) Median vertical incision:
(a) Skin
(b) Subcutaneous tissues
(c) Deep cervical fascia
(2) Exposure of trachea: between
(a) Cricoid
& (b) Isthmus
(3) Steady the cricoid with a hook
(4) Stab and introduce the dilator: between
(a) Cricoid
& (b) Isthmus
(5) Introduction of cannula

(C) Median trans-isthumus tracheotomy : Digby

Ind : (1) Easy introduction of tube
(2) No hæmorrhage

Tech : (1) Midline incision 1·5″ from upper border of the cricoid downwards
(2) Exposure of the cricoid
(3) Transverse incision of the fascia attached to the lower border of the cricoid,
(4) Passage of a hæmostat behind the isthumus
(5) Division of the isthumus between two clamps
(6) Exposure of the first four rings of the trachea beneath the isthumus
(7) Tranquil tracheotomy of St. Clair Thomson:
: Injection of 2·5% cocaine in the trachea:
: 20 minims in adults
: 5 minims in children
(8) Vertical incision through 2, 3 & 4th rings
(9) Excision of margins to form an oval window
(10) Insertion of tracheotomy tube
(11) Approximation of the skin around the tube

(D) Low infra-isthumus tracheotomy:

Tech : (1) Incision down to suprasternal notch
(2) Exposure of isthumus
(3) Dissection and exposure of trachea
(4) Open the trachea from below upwards

(E) Urgent tracheotomy :

Tech : (1) Skin incision 3″ down from cricoid
(2) Lift up the larynx by hook under cricoid
(3) Stab the trachea ·5″ below the cricoid
(4) Introduce hæmostat along the blade
(5) Open the hæmostat
(6) Insert the tracheotomy tube
(7) Remove the hook

After-treat :
(1) Double-folded gauze apron moistened with water over the mouth of the tube
(2) Cleansing and reintroduction of inner tube:
(a) Feather introduction
(b) Soda-bi-carb sol. spray
(c) Soda sol. wash
(3) Steam inhalations
(4) Replacement of metal tube by Morrant Baker's rubber tube
: After 4 days
(5) Omittance of the tube as early as possible

Post. compl :
(1) Shock and collapse
(2) Hæmorrhage
(3) Respiratory failure: give Co2

(4) Displacement of tube:
 (*a*) Manual
 (*b*) Cough
(5) Emphysema
(6) Cervical cellulitis → mediastinitis
(7) Bronchitis → bronchopneumonia
(8) Sloughing → ulceration → stenosis
(9) Necrosis of trachea
(10) Extension of disease downwards

(V) IMPORTANT POINTS

(I) PHARYNX:

(A) Trauma:

(1) Escape of saliva is the pathognomonic sign of trauma to the pharynx.

(B) Infection:

(2) Retropharyngeal abscess:
 (1) Acute: between pharynx and prevertebral fascia
 (2) Chronic:
  (*a*) Behind prevertebral fascia: T. B. spine
  (*b*) Behind pharyngeal wall: T. B. glands.

(3) *Retropharyngeal abscess:*
 (1) *Acute: open through the mouth*
 (2) *Chronic: open via the neck.*

(4) Do not allow the pus under tension flood the pharynx when opening the acute retropharyngeal abscess; use small incision with suction apparatus or *aspirate before incision.*

(5) Abscesses in the pharynx:
 (*a*) Peritonsillar abscess
 (*b*) Paratonsillar abscess
 (*c*) Parapharyngeal abscess
 (*d*) Retropharyngeal abscess:
  (α) Acute
  (β) Chronic.

(C) New growths:

(6) Sites for new growths of the pharynx:
 (*a*) Nasopharynx
 (*b*) Oropharynx
 (*c*) Epilarynx
 (*d*) Hypopharynx.

(7) Malignant growths of the posterior third of the tongue are highly malignant; while growths of the fauces, tonsils and palate are not so malignant.

(8) In carcinoma of the oropharynx, neck should be left alone if there are no palpable glands and the patient should be kept under close and repeated observations.

(9) Excision by diathermy knife is very effective in early carcinoma of: (*a*) The fauces
(*b*) Palate
(*c*) Tonsils
(*d*) Posterior pharyngeal wall
(*e*) Base of the tongue.

(10) *Post-cricoid carcinoma is frequent in young females;* while pharyngeal diverticulum is more common in middle aged males.

(11) In cases of post-cricoid carcinoma, severe dysphagia and more than moderate enlargement of cervical glands denote inoperability of the growth.

(12) Lympho-sarcomata and squamous carcinomata are the most common malignant tumours of the pharynx.

(13) *Enlarged cervical glands may be the first sign of malignancy of the pharynx.*

(14) Summary of diathermy of oropharyngeal tumours:
(1) Group I: Small growths without glands:
Treat: Diathermy excision or coagulation
(2) Group II: Large growths without glands:
Treat: (*a*) Primary block dissection
+ Ligation of ext. carotid art.
↓ (*b*) Diathermy
(3) Group III: Extensive growths with or without glands:
Treat: (*a*) Primary block dissection
+ Ligation of ext. carotid art.
↓ (*b*) Removal of half the jaw
+ Diathermy
(4) Group IV: Doubtful malignancy:
Treat: (*a*) Biopsy
↓ (*b*) Diathermy, radium or X-Rays.

(D) **Operations:**

(15) Do not forget to exclude cervical cellular tissues at the time of pharyngeal incision by *suture of sterno-mastoid to prevertebral muscles* and by packing.

(II) LARYNX:

(A) **Trauma:**

(16) Do not forget sinus pyriformis and valecula while searching for foreign bodies in larynx.

(4) Displacement of tube:
  (a) Manual
  (b) Cough
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(D) **Operations :**

(15) Do not forget to exclude cervical cellular tissues at the time of pharyngeal incision by *suture of sterno-mastoid to prevertebral muscles* and by packing.

(II) LARYNX :

(A) **Trauma :**

(16) Do not forget sinus pyriformis and valecula while searching for foreign bodies in larynx.

(17) Always keep a watch for œdema glottis in a case of scalds of the pharynx.

(B) **Infection:**

(18) *Causes of œdema glottis:*
(1) *Scalds of the pharynx*
(2) *Oral, submaxillary and cervical infection.*

(19) In doubtful cases of laryngitis, try antisyphilitic measures.

(20) Nearly all cases of tuberculous laryngitis are secondary to phthisis.

(21) In T. B. patients, catarrhal laryngitis is tuberculous unless proved otherwise.

(C) ***Carcinoma larynx:***

(22) Carcinoma larynx occurs in males between 50 and 60 in 90% of cases.

(23) Carcinoma larynx:

Types: (a) Intrinsic
(b) Extrinsic

Path: Squamous carcinoma

Clinic: (a) Hoarseness → aphonia
(b) Dyspnœa } : Intrinsic.
(c) Dysphagia
(d) Enlarged cervical glands } : Extrinsic.

Compl: Chest affections

Treat: (A) Intrinsic:
(a) Mobile cord: laryngo-fissure
(b) Fixed cord: laryngectomy or radiation
(c) Subglottic: laryngectomy
(d) Anterior commissure: laryngectomy

(B) Extrinsic:
(a) Epiglottis: lateral pharyngotomy
(b) Aryepiglottic: lateral pharyngotomy
(c) Post-cricoid: lateral pharyngotomy
(d) Pyriform: pharyngo-laryngectomy

(24) Abuse of voice is a common cause of chronic laryngitis → keratosis → papillomatosis → granulomatosis → carcinoma.

(25) Larynx is sometimes the seat of multicentric carcinoma

(26) Extrinsic carcinoma of larynx:
(a) Epilaryngeal
(b) Fossa pyriformis

(27) Intrinsic carcinoma of larynx:
(a) Cords
(b) Ventricular
(c) Subglottic.

(28) Tubercle attacks posterior part of the larynx where epithelium is columnar. Carcinoma attacks anterior part of the larynx where epithelium is squamous.

(29) Persistent hoarseness and vocal fatigue in elderly males : ? Intrinsic carcinoma larynx.

(30) *Hoarseness of more than two weeks' duration in elderly males may be due to early intrinsic carcinoma.*

(31) Hoarse voice is the first sign of :
  (1) Laryngitis
  (2) Intrinsic carcinoma

(32) *Secondaries in cervical glands are absent till late in intrinsic carcinoma of the larynx; while they are the first sign in extrinsic type.*

(33) Extrinsic carcinoma :
  (1) First sign is enlarged cervical glands
  (2) Primary growth insignificant
  (3) Dysphagia more prominent than voice trouble.

(34) Intrinsic carcinoma :
  (1) First sign is huskiness of voice or dyspnœa
  (2) Late enlargement of glands.

(35) Enlarged secondary cervical glands without any appreciable primary :
  : ? carcinoma of fossa pyriformis.

(36) Laryngeal affection is carcinoma in the absence of :
  (*a*) Misuse
  (*b*) Pulmonary tuberculosis
  (*c*) Syphilis.

(37) Most of the morbid enlargements in the larynx are of inflammatory or hæmorrhagic origin but clinically they must be regarded as tumours and should be removed unless there is generalised syphilis or tuberculosis. All excised growths must be examined microscopically to exclude malignancy.

(38) *Any unilateral congestion, fibrosis, tumour or ulcer of the cord with sluggish movements, in middle-aged males : ? carcinoma larynx.*

(39) Operative procedures in carcinoma larynx :
  (1) Diathermy : in carcinoma larynx
  (2) Laryngo-fissure :
    : Early growths on anterior ⅔rds of the cord
  (3) Laryngectomy : highly malignant growths
  (4) Pharyngotomy : advanced growth of :
    (*a*) Epiglottis
    (*b*) Base of the tongue
    (*c*) Aryepiglottic fol
    (*d*) Post-cricoid regi

(40) [illegible]
(1 [illegible]
(2 [illegible]

(41) Radium needles after subperichondrial removal of the cartilage is good for intrinsic carcinoma. Deep X-Rays are better for extrinsic carcinoma.

(E) Operations:

(42) *Laryngotomy with intubation is suitable only for adults and for cases where there is no need to keep the tube for more than 48 hours.*

(43) A cyanosed and asphyxiated patient can be relieved by laryngotomy more readily than by any other method.

(44) Fixation of the cord a contraindication for laryngo-fissure.

(45) Enlargement of cervical glands is not a contraindication for laryngectomy, except where they are so fixed as to necessitate removal of common carotid artery.

(46) If a preliminary tracheotomy is done for laryngectomy it shall be a low one.

(47) Laryngectomy: operations
(1) One stage: (*a*) Ascending: Perier
(*b*) Descending: Gluck
(2) Preliminary tracheotomy
↓ One stage laryngectomy
(3) Two stage: Crile
(*a*) Exposure of trachea and larynx
↓ Tracheotomy
↓ Iodoform gauze isolation
↓ (*b*) Laryngectomy
(4) Multiple stage:
(*a*) Isolation of larynx and trachea
↓ (*b*) Tracheotomy
↓ (c) Laryngectomy.

(48) Steps of laryngectomy:
(1) Tracheotomy
(2) Isolation of larynx and ligature of vessels
(3) Excision of lymph glands
(4) Separation of larynx: from
(*a*) Pharynx
(*b*) Œsophagus
(5) Closure of the pharynx
(6) Separation of larynx from trachea
(7) Suture of trachea to the skin
(8) Closure and drainage of the wound.

(49) In laryngectomy, prevent retraction of cut lower end of the trachea into the thorax by preventive anchoring before its division across. Do not cut the whole circumference till the anterior half is anchored. Do not tie the anchor sutures too tightly.

(F) **Miscellaneous :**

(50) Most common cause of post-operative bilateral abductor paralysis is traction on the recurrent laryngeal nerves during thyroidectomy.

(51) If laryngeal paralysis lasts for more than 12 months, there is little hope of recovery.

(III) TRACHEA :

(A) **Trauma :**

(52) Foreign body passing the cricoid will not completely obstruct the trachea.

(53) After tracheotomy for foreign body in the trachea, search for it as soon as possible even when it is said to have been removed.

(54) *All is not asthma that wheezes* (Chevalier Jackson).

(55) *Silent tracheotomy is the cardinal sign of impacted foreign body in the trachea.*

(B) **Operations : Tracheotomy :**

(56) Indications :

(1) Tracheotomy :
(*a*) Children
(*b*) Obstruction taking time

(2) Laryngotomy :
(*a*) Adults
(*b*) Obstruction of not more than 48 hours.

: *Chief indications :*
(*a*) *Diphtheria*
(*b*) *Acute œdema glottis*
(*c*) *Preoperative*
(*d*) *Foreign bodies.*

(57) Tracheotomy is the operation for private practice; intubation is the operation for hospital practice; as the attending nurse can do something in accidental removal of tube in tracheotomy but nothing in intubation.

(58) *Main indication of tracheotomy is diphtheria.*

(59) *The two emergency measures to be considered in dyspnœa due to obstruction are :*
(*a*) *Tracheotomy : for children*
(*b*) *Laryngotomy : for adults.*

(60) *Any patient with sufficient obstruction to cause audible stridor on exertion is in the danger zone. If stridor is noticeable when resting, tracheotomy should be considered. If it is audible when he is asleep, tracheotomy is urgently needed.*

(61) Tracheotomy is no good for obstruction in thoracic trachea: Retrosternal goitre.

(62) *Important points in tracheotomy:*
- (1) *No deviation or rotation of head*
- (2) *Extension of neck:*
  : Chin and episternum in one plane
- (3) *Incision exactly in midline*
- (4) Cricoid hook not to be removed till tube is in
- (5) Tranquil tracheotomy.

(63) Low tracheotomy is difficult in adults as it is deep. It is dangerous in children as left innominate vein may intervene.

(64) Special points in tracheotomy for diphtheria:
- (1) *Every one to wear mask*
- (2) Cover the wound as soon as trachea is opened
- (3) Find out whether membrane has extended beyond tracheal stoma
- (4) Antidiphtheritic serum for every contact.

(65) *Tracheotomy set and intubation instruments must be kept ready by the bedside of a diphtheritic patient at all times.*

(66) Outer tracheotomy tube should not be removed for at least 4 days.

(67) Accidental removal of the tube and blocking of the tube should be guarded against in the after-treatment of tracheotomy.

IV) MISCELLANEOUS:

(68) *Respiratory obstruction and aspiration are the most important factors in the production of respiratory complications after operations.*

(69) Ether and gas are to be avoided in every case of real or potential asphyxia.

(70) *No operation upon the respiratory tract should be undertaken unless a tracheotomy set is ready at hand.*

(71) Laryngotomy tube is oval on cross section; while tracheotomy tube is round.

(72) In novocain injection of deep nervous plexuses, make certain that the needle is not in a blood-vessel, by aspirating just before injection.

(73) In laryngeal and pharyngeal operations, contact of mucous and saliva with the raw surfaces produces inflammatory complications: local, respiratory and general

(74) *Basal anæsthesia should be avoided in operations on larynx or pharynx.*

(75) *Atropine is of great value in operations on parts with mucous or salivary exudation as a preanæsthetic medication.*

(76) Never make a direct communication between the cervical tissues and the oral or pharyngeal cavity.

(77) Laryngeal cartilages have poorer powers of repair than most cartilages; in the adults it always unites by fibrous tissue.

(78) *When mucous membrane is to be joined to the skin, use* ***silk*** as silkworm-gut tears the mucous membrane and catgut necroses the skin.

CHAPTER II

THE BRONCHI AND THE LUNGS

THE BRONCHI

(I) TRAUMA:

: FOREIGN BODIES IN THE BRONCHI:

Clinic: (1) History or no history
(2) Cough + local pain + rales: small f. b.
↓ (3) Asthmatoid wheeze on expiration: larger f. b.
↓ (4) Emphysema lung: still larger f. b.
↓ (5) Collapse or atelectasis lung: largest f. b.

Signs: (1) X-Ray
(2) Diagnostic bronchoscopy:
(*a*) High: oral
(*b*) Low: tracheal

Diff. diag: (1) Asthma
(2) Bronchiectasis
(3) Abscess lung
(4) F. B. in œsophagus

Compl: (1) Suffocation
(2) Broncho-pneumonia
(3) Emphysema
(4) Collapse
(5) Abscess or gangrene lung
(6) Bronchiectasis

Treat: **Bronchoscopic extraction:**
(*a*) Without tracheotomy
(*b*) With tracheotomy

(II) INFLAMMATION:

(1) ACUTE TRACHEO-BRONCHITIS:

(A) **Catarrhal bronchitis:** Post-operative

Etio: (*a*) Pre-operative bronchitis
(*b*) Exposure
(*c*) Ether anæsthesia

Onset: Within 48 hours of anæsthesia

Clinic: (*a*) Cough (dry → wet) with dyspnœa
(*b*) Physical signs
(*c*) General toxæmia

Treat: (1) Deep breathing: every hour or two
(2) Steam inhalations: with
(*a*) Creosote
(*b*) Tr. benzoin co.

Etio: (*a*) Children: congenital
(*b*) Adults: acquired

Causes: (A) **Acute:**
- (*a*) Unresolved broncho & lobar **pneumonia**
- (*b*) Inhalation of **foreign body**
- (*c*) Acute **bronchitis**

(B) **Chronic:**
- (*a*) **Congenital** abnormality of bronchial tree
- (*b*) **Bronchial affections:**
  - (α) Pressure from without
  - (β) Obstruction to lumen
- (*c*) Atelectasis of the lung
- (*d*) Chronic **affections of the lung**

Path. varieties: (1) **Congenital** or cystic juvenile:
- (*a*) Single
- (*b*) Multiple
- (*c*) Honeycomb

(2) **Acquired** or adult:
- (*a*) Cylindrical type: dilated bronchi
- (*b*) Fibrotic type: fibrosed bronchi
- (*c*) Saccular type: cavities + ulcers

Sites: (*a*) Local: basal
(*b*) Whole one side
(*c*) Bilateral.

Clinic: (1) Intermittent **cough with inoffensive or fœtid expectoration:** Varying on posture
(2) Signs of **wet consolidation** of lung
(3) General **chronic toxæmia**
(4) Clubbing of fingers

Signs: (A) **X-Ray:**
- (*a*) **Ordinary:** Radiating dense shadows
- (*b*) **Lipoidol:** Glove-like fingers blobs

Tech: 15–40 c.cs.
- (α) Crico-thyroid route
- (β) Supra-glottic route

(B) **Sputum examination:** Elastic tissue

Diff. diag: (1) Other chronic bronchial affections
(2) Chronic lung affections, esp. T.B.

Compl: (1) Pneumonia
(2) **Cerebral abscess**
(3) Chronic toxæmia → Amyloid disease

Treat: (A) **Conservative:**
- (*a*) Antiseptic inhalations and expectorants
- (*b*) Vaccines
- (*c*) N. A. B. injections

(B) **Drainage :**
- (*a*) **Postural drainage :**
  - : The position depends on the lobe affected and must be maintained for at least 22 out of 24 hrs. of the day till expectoration ceases
- (*b*) Bronchoscopic aspiration

(C) **Collapse therapy :**
- (*a*) **Phrenic avulsion :** For hæmoptysis
- (*b*) Artificial pneumothorax
- (*c*) Oleothorax
- (*d*) **Thoracoplasty :**
  - (α) Sauerbruch : posterior resection
  - (β) Wilms : posterior & anterior resection
  - (Γ) Brauer : whole resection

(D) **Excision of the diseased lobe :**
- : **Lobectomy :**
- (*a*) **Operative**
- (*b*) Cautery : Graham
- (*c*) Deliverance : Whittemore

Pre-operative : (1) Conservative and postural measures :
- : To reduce toxæmia
- (2) Attention to oropharynx
- (3) Good X-Ray plates

(3) BRONCHIAL FISTULA :

Etio : (1) Empyema
- (2) Lung abscess
- (3) Bronchiectasis
- (4) Foreign body with infection

Diag : (*a*) Injection of methylene blue into the sinus
- ↓ (*b*) Appearance in sputum

Treat : (1) Cauterisation
- (2) Excision of the tract and closure

(III) NEW GROWTHS :

: BRONCHIAL CARCINOMA : (See under Lung)

THE LUNGS

(I) CONGENITAL AFFECTIONS :

: **Polycystic or congenital cystic disease :**

: (See under Cysts of Lung)

(II) TRAUMA :

: WOUNDS OF THE LUNG :

Etio : (*a*) **Crush** injuries : secondary to fracture rib
- (*b*) **Penetrating** injuries : stab wounds
- (*c*) **Gunshot** injuries

Clinic: (1) Shock
(2) Pain
(3) **Dyspnœa**
(4) **Hæmoptysis**
(5) **Surgical emphysema**

Signs: (1) Immobility
(2) Moist rales
(3) **Consolidation**
(4) Pyrexia

Compl: (1) **Pneumothorax:**
(*a*) Closed
(*b*) Open
(*c*) Valvular
(2) **Hæmothorax**
(3) **Empyema**
(4) **Pneumonia**

Treat: **Debridement, sterilisation and air-tight closure:**

Ind: (1) **Open pneumothorax**
(2) 'Stove in' chest with lacerated pleura
(3) **Penetrating wound:** with
(*a*) Progressive bleeding
(*b*) Hæmoptysis
(*c*) Hæmothorax
(*d*) Retained missile
(*e*) Massive pneumonia
(4) **Potential Sepsis** in pleura or lung

Tech: (1) Debridement and sterilisation of wound
(2) Immediate air-tight suture
(3) Strapping of the chest

Per. treat: (1) Sedatives
(2) Respiratory antiseptics
(3) Anti-tetanus and anti-gas-gangrene
(4) Chemotherapy: sulphonamides

POST-OPERATIVE LUNG CONDITIONS:

(1) HYPOSTATIC PNEUMONIA:

Def: Basal congestion → pneumonic consolidation:
: Due to deficient æration and postural gravity

Etio: (1) Fat, debility and exposure
(2) Pre-existing chest disease
(3) **Respiratory muscle paresis:**
(*a*) Upper abdominal operations
(*b*) General exhaustion
(4) **Constant supine position**

Cause: **Deficient æration of the lung bases**

Clinic: **Basal signs of bronchitis → pneumonia**

Treat: (A) **Prophylactic:**

(1) Choice of anæsthesia: avoid ether
(2) Anticatarrhal vaccine
(3) Frequent **changes in posture**
(4) Co_2 inhalations or **deep breathing**
(5) Stupes to the chest
(6) Camphor in oil injections

(B) **Curative:**

(1) Expectorants
(2) **M. & B. 693**

(2) POST-OPERATIVE PNEUMONIA:

Etio: (1) Worsening of **pre-operative** condition
(2) **Hypostatic** pneumonia: deficient æration
(3) **Aspiration** pneumonia: septic aspiration
(4) **Septicæmic** pneumonia: blood infection
(5) **Exposure** pneumonia: bad weather + shock
(6) **Anæsthetic** pneumonia: ether irritation
(7) **Secondary** pneumonia: to atelectasis etc.
(8) **Infarction** pneumonia: primary thrombosis

Varieties: (A) **Pneumococcal lobar pneumonia:**

Etio: Rare

Cause: Antecedent respiratory catarrh

(B) **Broncho-pneumonia:**

(1) Primary: severe, abrupt and early
(2) Secondary: later and milder

Clinic: (1) **Primary:**

(a) Respiratory embarrassment
(b) Local signs
(c) General toxæmia

} :+·

(2) **Secondary:** All signs milder

Diagnosis: (1) Severe toxæmia
(2) Higher temperature
(3) Greater respiratory distress
(4) Sputum: purulent and bloodstained

Compl: (1) Pulmonary abscess
(2) Diffuse septic pneumonitis
(3) Pulmonary gangrene
(4) Empyema or pyopneumothorax

(C) **Septic aspiration pneumonia:**

Etio: (1) Operations on:

(a) Oral cavity
(b) Upper respiratory passages
(c) Alimentary obstruction

(2) **Disappearance of cough reflex**
(3) *Sitting posture*

Path: Aspiration of:
- (*a*) Blood
- (*b*) Pus
- (*c*) Vomit
- (*d*) *Foreign body*

Preventive treat: (1) **Posture: Head lower than the trunk**
- (*a*) Trendelenburg
- (*b*) Rose
- (*c*) Reversed

(2) Endotracheal anæsth. + pharyngeal plug
(3) **Keep up the cough reflex**
(4) Avoid cyanosis

Treatment of post-operative pneumonia in general:

(1) Treat the preoperative chest condition
(2) Avoidance of exposure
(3) Gastric washes and care of the respiratory passages
(4) Early treatment of septicæmia and septic foci
(5) Avoidance of general (*especially ether*) anæsthesia
(6) Abundant fluids: by mouth and rectum
(7) Careful venoclysis
(8) Prophylactic treatment: (See above)
(9) Curative treatment:
- (*a*) Sitting and changing posture
- (*b*) Oxygen with CO_2
- (*c*) Stimulant expectorants
- ↓ (*d*) Pulmonary antiseptics: camphor, M. & B. 693
- (*e*) Heart supporters

(10) Injection therapy:
- (*a*) Digitalin $\frac{1}{250}$ gr. 8 hourly
- (*b*) **Atropine sulph. $\frac{1}{100}$ gr.** / **Strychnine $\frac{1}{64}$ gr.** / **Adrenaline 5-10 min.** } **6 hourly**
- (*c*) Pituitrin $\frac{1}{2}$-1 cc.
- (*d*) Camphor in oil
- (*e*) Coramine
- (*f*) Caffeine sodium benzoate
- (*g*) Strophanthin $\frac{1}{200}$ gr. B. D.
- (*h*) Glucose intravenous

(3) ACUTE ŒDEMA OF THE LUNGS:

Etio: (*a*) **Chest condition**
+ (*b*) **Ether anæsthesia**
+ (*c*) **Intravenous hydrotherapy**

Clinic: (1) Rapid onset and course
(2) Oppression, pallor, **dyspnœa**
(3) **Frothy abundant expectoration:**
: From nose & mouth
(4) Pneumonic consolidation with **moist sounds**

Treat: (A) **Prophylactic:**
(a) Pre-operative **atropine**
(b) Treat pre-operative chest condition
(c) Avoidance of ether
(d) **Careful intravenous hydrotherapy**
(e) Post-operative prophylaxis

(B) **Curative:**
(a) Morphia $\frac{1}{3}$ gr. + **atropine** $\frac{1}{100}$ **gr.**
(b) **Venesection:** 500–800 c.cs.
(c) **Medicinal:**
(α) Ouabain
(β) Theobromine
(γ) Digitalin

(4) PULMONARY COLLAPSE:

Etio: **Surgical operations** with any anæsthesia

Path. factors: (1) **Inhibition of cough reflex**
(2) **Inhibition of respiratory musculature:**
(a) Abdominal muscles
(b) Diaphragm
(c) Inspiratory muscles
(d) Accessory respiratory muscles
(3) **Bronchial obstruction:** Due to
(a) Secretion: ether anæsthesia
(b) Œdema
(c) Spasm
(4) **Septic aspiration:**
: From oral or pharyngeal cavity
(5) **Open operation or trauma**

Morb. anat: (a) **Plug of mucus**
+ (b) Spasm of bronchus
+ (c) Œdema of bronchial muc. mem.
↓ (d) **Bronchial obstruction**
↓ (e) **Absorption of alveolar air**
↓ (f) **Collapse of the lung**

Varieties: (A) **Partial basal:**

Onset: Within a **few hours**

Clinic: (1) **Mechanical resp. embarrassment:**
(a) Dyspnœa
(b) Cyanosis
(c) [illegible]
(2) [illegible]
(3) [illegible]

(B) **Pulmonary : Heart and respiratory crisis**
- (*a*) Precordial pain
- (*b*) Dyspnœa
- (*c*) Cyanosis
- (*d*) Shock
- (*e*) Unconsciousness

(C) **Lungs : Infarction pneumonia**
- (*a*) Respiratory pain
- (*b*) Dyspnœa
- (*c*) Cyanosis
- (*d*) Hæmoptysis
- (*e*) Consolidation of lungs

Diff. diag : (1) **Acute heart failure**
- (2) Coronary embolus
- (3) Acute internal hæmorrhage
- (4) Cerebral hæmorrhage
- (5) **Pneumonia**

Treat : (A) **Prophylactic :**
- (1) **Anticoagulant :**
  - : Sod. citras grs. xxx T. D. S.
- (2) **Pre-operative :**
  - (*a*) Avoidance of dehydration
  - (*b*) Avoidance of protein food
- (3) **Operative :**
  - (*a*) Avoidance of rough handling
  - (*b*) Avoidance of hæmorrhage
- (4) **Post-operative :**
  - (*a*) Avoidance of dehydration
  - (*b*) Avoidance of protein food
  - (*c*) Avoidance of stagnation : by
    - (α) Deep breathing
    - (β) Movements of extremities
  - (*d*) Complete immobilisation of part containing primary thrombus :
    - : for three weeks

(B) **Curative :**
- (1) **Conservative :**
  - (*a*) **Oxygen** in sitting posture
  - (*b*) **Morphine + atropine**
  - (*c*) Amyl nitrite
  - (*d*) Venesection
  - (*e*) Stimulant injections
- (2) **Operative :**
  - **: Trendelenburg's pulm. embolectomy:**
  - Ind : Pulmonary artery embolus
    - ↓ Unconsciousness + absent heart beat
    - : (Heart and respiratory crisis)

Tech : (See under Operations on Heart)

(6) PULMONARY SUPPURATIONS :

: (See under next heading)

General etiology of post-operative chest complications :

Frequency : 10% of all laparotomies

Pre-disp : (1) **Age :** Extremes
(2) **Previous chest disease**
(3) **Obese** males
(4) **Nature of operations :**
Sites : (*a*) Abdominal
(*b*) Respiratory passages
Factors : (1) Long duration
(2) Rough handling
(3) Much hæmorrhage
(4) Sepsis
(5) **Anæsthesia**
(6) Pre and post operative treatment

Factors : (1) **Impaired respiratory expansion :**
(A) **Avoid :**
(*a*) Trauma to diaphragm
(*b*) Respiratory depressants :
: **Morphia,** heroin
(*c*) Mechanical constriction :
(α) Abnormal posture
(β) Tight bandage
(B) **Give :**
(*a*) **Atropine 1/100 gr. :**
: Expectorants
: Respiratory antiseptics
: Pot. iodide
(*b*) Fowler's sitting posture :
: **Frequent changes in posture**
(*c*) **Breathing exercises :**
: CO_2 inhalations
(*d*) Massage and movements of limbs
(2) **Pre-existing infection : oral, throat, chest**
(A) Treat any pre-existing infections
(B) Postpone the operation if :
(*a*) Active infection
(*b*) Bad weather
(3) **Chill and exposure :**
(A) Maintenance of body heat :
: During and after the operation
(B) Warm packs to body and viscera
(4) **Septic aspiration :**

- (A) Operate under anæsthesia:
  - (a) Local or regional
  - (b) General: sodium evipan
- (B) Reversed posture
- (C) **Preserve the cough reflex**
- (D) Avoid respiratory aspiration:
  - By: Gastric aspiration
  - : Pharyngeal plug

(5) **Inadequate circulation & body fluids:**

- (A) Treat inadequacy:
  - (a) Avoid shock and collapse
  - (b) Avoid thrombosis and embolism
- (B) Prevent hyper-adequacy:
  - : **Avoid large venous infusions** in cases with probabilities of:
    - (α) Œdema of the lungs
    - (β) Failure of the heart

Prophylaxis of post-operative chest complications:

In all operations on:

- (a) Nose
- (b) Nasal sinuses
- (c) Mouth cavity
- (d) Pharynx
- (e) Upper respiratory passages

(1) Take systematic care of nasal and oral hygiene

(2)

(3)

(4) **Prevention of respiratory aspiration**

(5) Post-operative:

- (a) Frequent postural changes
- (b) Pulmonary gymnastics
- (c) Encouragement of cough
- (d) CO_2 inhalations
- (e) Respiratory antiseptics
- (f) Stimulant injections
- (g) Balanced hydrotherapy
- (h) Protection from exposure

(IV) PULMONARY SUPPURATIONS:

(1) DIFFUSE PULMONARY PNEUMONITIS:

Etio: Post-operative

Path: (a) Bronchial obstruction + infection

↓ (b) Multiple small abscesses

Clinic: Signs of broncho-pneumonia

Diff. diag: Broncho-pneumonia

Treat: Of broncho-pneumonia

(2) ABSCESS OF THE LUNG:

Def: Infective gangrene of a segment of the lung, leading to formation of an abscess cavity, containing foul pus and sloughs and surrounded by an area of pneumonitis.

Etio: (1) **Upper air passages:** Aspiration from
- (a) Gingivo-dental sepsis
- (b) Accidental sepsis
- (c) **Post-operative:**
  - (α) **Aspiration:** (1) Blood (2) Pus (3) Vomit (4) F. B.
  - (β) Embolic
  - (γ) Lymphatic extension

(2) **Bronchi:** Putrid bronchitis
: Bronchiectasis

(3) **Lungs:**
: Pneumonia, infarction, collapse, growth

(4) **Pleura:** Empyema

(5) **Embolic:**
: Primary thrombotic or septic focus

(6) **Traumatic**

Etio. class: (1) **Post-pneumonic**
(2) **Post-operative:**
- (a) Tonsillectomy
- (b) Dental extraction

(3) **Aspiration:** Of f. b. or septic material
(4) **Pyæmic**
(5) **Carcinoma** lung
(6) **Secondary:** Rupture of liver abscess

Site: **Periphery of right lower lobe**

Path. class:
- (1) Unilocular
- (2) Multilocular

- (A) Hilar
- (B) Central
- (C) Peripheral
- (D) Lobar

- (a) Open: (α) Bronchus (β) Pleura
- (b) Closed

Bact: (1) **Streptococcus**
(2) **Pneumococcus**
(3) Staphylococcus
(4) B. influenzæ
(5) **Spirochætæ**

Morb. anat: (1) **Cavity**: Containing disintegrated lung tissue
(2) **Surrounding zone of consolidation**
(3) Peripheral **zone of normal lung**
: **Diffuse widespread gangrene to small localised *fibrous-walled chronic* abscess**

Clinic: (1) **History**: Of one of the etiological factors
(2) **General septic toxæmia**
(3) **Lung symptoms**: 10th to 14th day
(*a*) Cough.
(α) Enormous quantity of pus
(β) *Hæmoptysis*
(γ) **Fœtid sputum**: Three layers
(1) Froth
↓ (2) Turbidity
↓ (3) Pus
(*b*) Dyspnœa
(*c*) Pain in chest
(4) Physical signs of lung: (*a*) Consolidation
↓ (*b*) Cavitation

Clinical types: (A) ***Unperforated or closed:***
: Vague signs
(B) **Perforated or open:**
(*a*) Acute course
(*b*) *Severe toxæmia*
(*c*) *Empyema or pyopneumothorax*

Special signs: (1) **X-Rays:**
(A) **Ordinary: Nature of shadows**
(1) Well defined in a clear field:
: Chronic abscess
(2) *Dark → opacity → normal*:
: Subacute abscess
(3) Diffuse irregular opacity:
: Acute abscess
(4) Widespread irregularly dense:
: Bronchiectasis
(5) Dense homogeneous with irregular margins:
: Diffuse pneumonitis
(B) **Lipoidol: Bronchography**
(1) Failure of lipoidol to reach the site of lesion
(2) Entry of lipoidol into the cavity with horizontal fluid level
(C) ***Tomograph***

(2) **Microscope:**
(a) **Sputum: Shreds of lung tissue**
Elastic fibres
(b) Blood: leucocytosis
(3) **Bronchoscopy**

Diff. diag: (1) **Bronchi:** Purulent bronchitis
: Bronchiectasis
(2) **Lungs:** Pneumonia
: Gangrene
: Tuberculosis
: New growth
(3) **Pleura:** Interlobar empyema
(4) **Neighbours:**
: Rupture of hepatic abscess into the lung

Compl: (1) **Lung: Broncho-pneumonia**
: Gangrene
: Hæmorrhage: hæmoptysis
(2) **Bronchi: Bronchiectasis**
: Bronchial fistula
(3) **Pleura:** Pleurisy
: Pyopneumothorax
: Empyema
(4) **Pericardium:** Suppurative pericarditis
(5) **General: Toxæmia**
: Amyloid disease
(6) **Special:**
(a) **Metastatic cerebral abscesses**
(b) **Hypertrophic osteoarthropathy**

Treatment:
(A) **Acute stage:**
: First 6-8 weeks: conservative
(1) **Medicinal:**
(a) Internal expectorants
(b) Deodorant inhalations:
: Creosote drm ii
: Acid carbolic drm ii
: Spt. chloroform drm ii
: Tr. iodine drm i
: Spt. ætheris drm i
(c) Intra-tracheal medications.
: 20 c.cs. of warmed 10% gomenol in lipoidol by intranasal catheter
(d) Specific medication:
: N. A. B.
: Emetine
: Quinine

(2) **Postural drainage:**
: For at least 22 out of 24 hours
Ind: **Communication with a bronchus**
Position: Depends on the site of the abscess:
(1) Acute rupture:
(a) Raise the foot of the bed
\+ (b) Normal lung uppermost
(2) Chronic rupture:
: Any position which drains best

(3) **Bronchoscopic aspiration:**
: Twice a week
Ind: (a) Root abscess
(b) **Bronchial abscess:**
(α) Failure of postural drainage
(β) Addition to postural drainage
(c) **Foreign body abscess**
(d) Diffuse septic pneumonitis

(4) Phrenic nerve avulsion:
Ind: (a) Basal abscess
(b) Bronchial abscess
(c) Hæmoptysis

(5) Pneumothorax: Dangerous
Ind: (a) Multiple abscesses
(b) Central abscess
(c) Bronchiectasis association
(d) Bronchial communication
(e) No pleural adhesions
Dangers: (1) Rupture into pleura
(2) Metastatic cerebral abscesses

(B) **Chronic stage:**
: **After 6–8 weeks: Operative**
Operative ind. (1) **After 6–8 weeks from onset**
(2) Septic or severe toxæmic course
(3) Persistent course
(4) Stationary course
(5) Increasing size
(6) 'Shut off' lesion
(7) **Peripheral lesion**
(8) Large lesion
(9) **Impending perforation:**
: Radiological evidence
Operations: (1) **Thoracotomy and drainage: Two stage**
Ind: (1) **Chronic local abscess**
(2) **Peripheral situation**

(3) No widespread changes
(4) Failure of conservative methods:
: For two months

Tech: (1) First stage: Exploration
: By resection of a rib
(a) Upper lobe: axillary
(b) Lower lobe: postero-lateral
↓ (2) Second stage: Drainage
Ind: One week after exploration
Tech: (a) Aspiration
↓ (b) Opening by finger
↓ (c) Drainage:
(α) Tube
(β) Packing
(γ) Cautery

(2) Lobectomy:
Ind. (1) Unilateral lobe affection
(2) Unilateral multiple abscesses
(3) Unilateral bronchiectasis
Pre-oper: Phrenic avulsion

(3) Thoracoplasty:
Ind: (1) Unilateral lobe affection
(2) Unilateral multiple abscesses
(3) Unilateral bronchiectasis
(4) Central abscess
(5) Bronchial drainage possible
(6) Persistent sinus
(7) Failure of lung wall to collapse

(3) GANGRENE OF THE LUNG:
Etio: (1) Post-operative
(2) Abscess lung
Path: Multiple areas of patchy gangrenous broncho-pneumonia
Clinic: (1) Pronounced signs and symptoms of abscess lung
(2) Sputum. (a) Nauseating fœtor
(b) Sloughs of lung tissue
(c) Hæmoptysis + +
(3) X-Ray: diffuse zone of dense opacity interspersed with clear areas
Treat: Medical: as for lung abscess

(V) CHRONIC AFFECTIONS OF THE LUNGS:

(1) PULMONARY TUBERCULOSIS:

Path. types: (1) Chronic, fibroid or productive
(2) Acute, pneumonic, caseous or exudative

Indications for surgical treatment:
(1) Local or unilateral focus
(2) Chronic, fibroid or productive type

(3) **Pulmonary compression:** For
- (*a*) Functional rest
- (*b*) Emptying of the lung
- (*c*) Check on the symptoms

Indications for collapse treatment:

(1) Chronic, slowly progressive, unilateral ulcero-cavernous or ulcero-fibrous

(2) Chronic persistent:
- (*a*) Cough with expectoration
- (*b*) Hæmoptysis

(3) Failure of: (*a*) Medical treatment
(*b*) Phrenic avulsion

(4) Tuberculous pyothorax

Contraindications for collapse treatment:

(1) Extensive disease of opposite lung
(2) Tuberculosis elsewhere
(3) Old age or poor general condition
(4) Heart, renal or other complications

Techniques of collapse treatment:

(1) Pneumothorax
(2) Extrapleural pneumolysis
(3) Thoracoplasty

Surgical procedures for pulmonary tuberculosis:

(1) **Artificial pneumothorax:**

(I) **Intrapleural pneumothorax:**

Ind: (A) **Unilateral focus:** Tuberculous
- (*a*) Acute exudative or ulcerous form
- (*b*) **Hæmoptysis:** Severe and repeated
- (*c*) Progressive disease
- (*d*) **Cavity formation**
- (*e*) Secondary infection
- (*f*) Associated laryngeal tuberculosis
- (*g*) Natural pneumothorax
- (*h*) Tuberculous pleurisy
- (*i*) Associated diabetes or pregnancy

(B) **Bilateral foci:** Tuberculous
- (*a*) Apical lesion on better side:
  - (α) Old fibrotic lesion of one apex
  - \+ (β) Contralateral acute spread
- (*b*) Not more than ⅓rd of opposite lung affected

(C) **Non-tuberculous** indications:
- (*a*) Pain of acute **pleurisy:**
  : 200—400 c.cs.

(b) Lobar pneumonia:
: Early and unilateral:
: 300—400 c.cs. at 24 hours intervals

(c) **Bronchiectasis:**
(α) Unilateral basal
(β) Recurrent hæmoptysis

(d) **Thoracoscopy:**
: Diagnostic or pre-operative

Contraind: (a) **Advanced bilateral foci**
(b) Tuberculosis elsewhere
(c) **Pleural adhesions**
(d) Pneumonic consolidation
(e) Intense fibrosis
(f) Intestinal or urinary toxæmia

Tech: (See under Operations on Chest)

Post. compl: (1) **Pleural syncope:**
Cause. Reflex inhibition of medullary centres through the vagus, independent of local anæsthesia
Treat: (1) Withdrawal of needle
(2) Antishock treatment

(2) **Temporary dyspnœa:**
Etio: (a) Cardiac displacement
(b) Mediastinal displacement:
(α) Opposite side
(β) Flapping
Causes: (1) High positive pressure
(2) Hypermobile mediastinum
Clinic: (a) Temporary dyspnœa & oppression
(b) Progressive loss of weight

(3) **Reaction:** Rise in temperature

(4) **Hæmorrhage**

(5) **Surgical emphysema**

(6) **Pleural effusion:**
Cause: Rupture of adhesions
Path: (a) Serous: not bad
(b) Hæmorrhagic
(c) Purulent: serious
Clinic: (a) Abrupt and early rise in pressure
(b) Malaise to dyspnœa
(c) Screening: periodical
Treat: Air replacement

(7) **Empyema**

(8) **Spread to contralateral lung:**
Clinic: (a) Exacerbation of symptoms
(b) Physical signs
(c) X-Ray

(6) Intercostal neurectomy:
Ind: An addition to phrenicectomy
Tech: Section of 2nd to 11th intercostal nerves

(7) Extrapleural thoracoplasty:

Extent: (A) Partial: basal or apical
(B) Complete

Ind: (1) **Unilateral widespread long-standing pulmonary tuberculosis with failure of or contraindication for pneumothorax**
(2) Fibro-caseous lesion with:
(*a*) Slight pyrexia
+(*b*) Hæmoptysis
+(c) **General good condition**
(3) Age between 15 and 40
(4) Tuberculous empyema
(5) Absence of complications elsewhere

Contraind: (1) **Bilateral disease**
(2) Age below 15 and above 40
(3) **Bad general health** with poor resistance
(4) T.B. elsewhere
(5) **Complications:**
(*a*) Lung
(*b*) Cardiovascular
(*c*) Renal
(*d*) Intestinal
(*e*) Laryngeal
(6) Local conditions: (*a*) Progressive disease
(*b*) Active disease
(*c*) Fibroid disease

Tech: (1) **Sauerbruch:** Posterior resection
(2) **Wilms:** Posterior and anterior resection
(3) **Brauer:** Whole rib resection
(See under Operations on Chest)

(2) PULMONARY SYPHILIS:

Path: (1) **Pulmonitis alba:**
: Congenital syphilis
: Peribronchial fibrosis with hepatisation
(2) **Tertiary syphilis**

Clinic: (1) Lung condition
(2) No tuberculosis
(3) Wassermann or Kahn
(4) Reaction to antisyphilitic treatment

Clinical types: (1) Whooping cough syndrome
(2) Chronic bronchitis
(3) Gummatous

(4) Exudative
(5) Pulmonary arterial sclerosis

Treat: Antisyphilitic

(VI) TUMOURS OF THE LUNG:

(1) CYSTS OF THE LUNG:
- (A) Solitary large cysts:
  - (a) Distension cysts in infants
  - (b) Small silent cysts
- (B) Multiple cysts:
  - (a) Medium-sized root cysts
  - (b) Small cysts:
    - (α) Lobar: honey-comb lung
    - (β) Diffuse or scattered

Compl: (1) Pressure
(2) Infection: cough, expectoration, fever

- (C) Poly-cystic or congenital cystic disease:

Theories: (1) Congenital
(2) Bronchiectatic

Sign: X-Rays: 'soap bubble' lung

- (D) Hydatid cyst

(2) SIMPLE TUMOURS:
- (a) Chondroma
- (b) Lipoma
- (c) Angioma
- (d) Endothelioma

(3) MALIGNANT TUMOURS:
- (A) **Primary bronchial carcinoma:**

Etio: **Men between 40 and 60**
: Right upper lobe

Cause: Chronic bronchial irritation

Origin: Mucous membrane of: (a) **Larger bronchi**
(b) **Bronchioles**

(1) Main stem bronchial
(2) Peripheral: bronchiolar

Path: (1) **Oat celled**: 50%
(2) **Squamous celled**: 20%
(3) Columnar celled
(4) Spheroidal celled
(5) Adeno-carcinoma

Spread: (A) **Infiltration**: Of parenchyma
(B) **Permeation:**
- (a) Peribronchial lymphatic permeation
- (b) Tracheo-bronchial lymph glands
- (c) Pleura

(C) **Embolism:**
- (a) Liver

(*b*) Brain
(*c*) **Bones**: Vertebræ, long bones

Clinic:

Symptoms: (1) **Cough and hæmoptysis**
(2) Chest pain: **pleurisy**
(3) Dyspnœa
(4) **Pulmonary suppuration**
(5) Debility and emaciation
(6) Metastatic symptoms

Signs: (1) **Local**: (*a*) Pleurisy
(*b*) Consolidation
(*c*) Collapse
(2) **Pressure**: Due to glandular secondaries
(*a*) Nerves
(*b*) Veins
(*c*) Trachea
(3) Bosco's homolateral contortion of chest:
: Due to muscle rigidity
(4) **Secondary metastases: Bones**
(5) Osteo-arthropathy

Special signs: (1) **X-Rays**: (*a*) Plain
(*b*) Lipoidol
(*c*) After pneumothorax
(A) **Hilar or bronchial**:
: Radiating shadow from hilum
(B) **Pneumonic**:
: Rounded, defined shadow with irregular density
(C) **Atelectatic**
(2) **Bronchoscopy** (+ Biopsy)
(3) **Sputum**: Wet film process

Diff. diag: (A) **Pulmonary group**:
(1) **Lung diseases**: Pneumonia
: Tuberculosis
(2) **Pleural diseases**: Pleurisy
: Hæmothorax
: Empyema
(3) **Bronchial diseases**: Bronchitis
: Bronchiectasis
(B) **Nervous group**:
(4) **Cerebral diseases**: Tumours
: Abscess
: Encephalitis
: Meningitis
(5) Spinal diseases: Transverse myelitis
: Paraplegia
: Caries
: Lumbago

(C) **Miscellaneous group:**
- (*a*) Gastric lesions
- (*b*) Gall bladder lesions
- (*c*) Liver lesions
- (*d*) Bone lesions

Compl: (1) **Bronchial:**
: Bronchitis, bronchopneum. bronchiectasis
(2) **Lung:**
: Atelectasis, abscess, gangrene, emphysema
(3) **Pleura:** Pleurisy, hæmothorax, empyema
(4) **Pressure** complications

Treat: (1) **Lobectomy:** (*a*) One-staged
(*b*) Multi-staged
Ind: Peripheral growths
(2) Pneumonectomy
(3) **Deep X-Rays**
(4) **Radon intubation**

(B) **Secondary carcinoma or sarcoma of the lung:**

Source: (1) Columnar or **spheroidal celled carcinoma**
(2) **Sarcoma**
(3) **Melanoma**

Path: (*a*) **Blood embolism**
(*b*) Peribronchial lymphatic permeation
(*c*) Infiltration

Clinic: (1) **Pulmonary signs** in every case of malignancy
(2) **X-Rays:** 'Cannon-ball' metastases

Treat: **Deep X-Rays**

(4) APICAL TUMOURS:

Varieties: (1) Apical lung carcinoma
(2) Bronchial growths
(3) Malignant metastases
(4) Nerve tumours

Syndrome: (1) Acute persistent unilateral shoulder girdle pain
(2) Horner's syndrome
(3) Paresis of hand

Signs: X-Rays: (a) Apical shadow
(*b*) Erosion of: (α) Ribs
(β) Transverse processes

Treat: Chordotomy: (palliative)

(VII) IMPORTANT POINTS

(A) **Collapse of the lung:**

(1) In massive collapse, the lung does not leave the chest wall; X-Ray shows dense homogenous one sided shadow with mediastinum, diaphragm and chest wall drawn towards the lung.

(2) Factors in massive collapse of the lung :
- (1) Inhibition of respiration and cough
- + (2) Thick and viscid bronchial secretion.

(3) Death from uncomplicated massive collapse is rare.

(4) Main causes of post-operative collapse of the lung :
- (1) Bronchial obstruction
- (2) Diaphragmatic and abdominal wall dysfunction.

(5) Apart from careful preoperative treatment, prevention of pulmonary collapse depends on maintenance of full respiratory excursions.

(6) All patients having a general anæsthetic should be hyperventilated with CO_2 at the end of the anæsthesia.

(B) Pneumonia :

(7) Avoid large amounts of intravenous fluids in cases where there is respiratory catarrh of any kind. Concentrated solutions such as 20% glucose can be given.

(8) Morphia and sedative linctus must be withheld in pneumonia.

(9) P [illegible]
- (a [illegible]
- (b [illegible]
  Strychnine hydrochlor 1/64 gr. } 6 hourly.
  Adrenaline 5–10 min. }
- (c) Pituitrin : ½–1 c.c.
- (d) Camphor in oil
- (e) Coramine
- (f) Caffeine sodium benzoate
- (g) Strophanthin 1/200 gr. B. D.
- (h) Intravenous glucose
- (i) Medicines : M & B. 693.
  Expectorants

(C) Lung abscess :

(10) Pulmonary suppuration .
- (a) Bronchial obstruction
- + (b) Infection : (α) Aspiration
  (β) Contiguity
  (γ) Blood.

(11) Of all cases of lung abscess, about three-fourths are post-operative ; the remainder being associated with pneumonia or malignant growths.

(12) Lung abscess follows tonsillectomy in between 1 in 2000 to 1 in 3000 cases.

(13) Pathognomonic signs of lung abscess :
- (A) (a) Local consolidation

↓ (*b*) Expectoration of considerable quantity of pus
↓ (*c*) Local cavitation
(B) (*a*) Signs of cavity developing rapidly after expectoration of a quantity of pus
(*b*) Elastic tissue in sputum
(*c*) Leucocytosis 20,000–30,000.

(14) Possibility of a lung abscess must always be considered when, following the acute onset of a respiratory illness, a large amount of purulent sputum is coughed up about the 10th to 14th day.

(15) As regards expectoration of sputum, there is relation between posture and quantity of sputum expectorated in: (*a*) Bronchiectasis
(*b*) Lung abscess.

(16) Large amount of pus expectorated:
? Lung abscess
? Liver abscess: burst in lung
? Empyema: burst in lung

(17) Differential diagnosis of sputa in abscess and gangrene:
(A) Abscess lung:
(*a*) Whitish-yellow, purulent
(*b*) Odourless
(*c*) Pyogenic organisms
(B) Gangrene lung:
(*a*) Foul-smelling
(*b*) Elastic tissue
(*c*) Spirochætes.

(18) In abscess of the lung, acute cases should be treated expectantly and chronic cases after 6 to 10 weeks should be treated surgically.

(19) In lung abscess, medical treatment should be given a trial for at least 6 to 8 weeks before resorting to surgery.

(20) A lung abscess is never to be aspirated by a syringe, as it leads to sepsis of the pleural cavity.

(21) If after about 3 weeks of medicinal treatment, no signs of commencement of drainage is forthcoming in lung abscess, pass in an aspirating bronchoscope.

(22) Bronchoscope is indicated in all cases of lung abscess as a diagnostic and therapeutic measure except in abscess of the upper lobe.

(23) When a lung abscess ruptures into a bronchus, take care of the aspiration into the other lung which must always be kept uppermost.

(24) As soon as the abscess has ruptured into a b: postural drainage should be instituted.

(25) Surgery is indicated in:
  (*a*) Failure to rupture into a bronchus
  (*b*) Failure of postural drainage.

(26) If at the end of three months, combined medical and bronchoscopic treatment effects no improvement, direct surgical drainage should be instituted.

(27) Delayed surgery has been responsible for the high mortality of lung abscess which is between 20 and 30%.

(28) Main surgical methods in lung abscess:
  (1) Thoracotomy and drainage
  (2) Lobectomy.

(29) Main lines of treatment in lung abscess:
  (A) Medicinal and supportive: for three weeks
  ↓ (B) Bronchial drainage: for three months
    (*a*) Postural
    (*b*) Bronchoscopic
  ↓ (C) Surgical drainage: After 8 to 10 weeks
  or (D) Lobectomy.

(30) Points about lung abscess.
  (*a*) Tuberculosis, foreign body and tumour are important local etiological factors
  (*b*) Thoracocentesis should be avoided
  (*c*) Pneumothorax is dangerous
  (*d*) If conservative methods fail for 6 weeks, surgery should be resorted to
  (*e*) Preoperative X-Ray
  (*f*) Two-stage operation under local anæsthesia and with dependent drainage.

(D) Pulmonary tuberculosis:

(31) Chief danger of any form of collapse is exacerbation of a tuberculous focus in parts of the lung or lungs, other than those in which collapse is prospected.

(32) Collapse therapy by pneumothorax or surgical means is specially indicated in cavernous type of the disease.

(33) Every case with active spreading disease of one lung and a positive sputum must be collapsed without delay.

(34) Methods of collapse therapy:
  (A) Conservative: pneumothorax
  (B) Surgical: (*a*) Phrenicectomy:
      (α) Crushing
      (β) Section
      (γ) Avulsion
    (*b*) Thoracoplasty: partial or complete
    (*c*) Pneumolysis.

(35) Complications of collapse therapy:
(*a*) Aspiration into healthy parts or lung
(*b*) Rupture into pleural cavity.

(*a*) Pneumothorax:

(36) Chief indication for artificial pneumothorax is pulmonary tuberculosis, either as a primary measure or as an addition to other measures and the principle is maximum degree of rest for the diseased area.

(37) Two primary factors in indications for pneumothorax:
(1) Degree of activity . indication
(2) Degree of fibrosis: contraindication.

(38) If pneumothorax treatment is to be given a trial, try it early before there is time for:
(*a*) Pleural adhesions
(*b*) Pneumonic consolidation
(*c*) Bilaterality.

(39) Pneumothorax is indicated in every unilateral disease in early adult life with:
(*a*) Persistently positive sputum
(*b*) Clinical evidence of activity
(*c*) Failure of improvement or actual spread after one month's rest, as seen by clinical and X-Ray methods.
(*d*) Younger patient
(*e*) More toxæmia.

(40) Every unilateral case of improved phthisis with reappearance of symptoms on resumption of activities should be submitted to pneumothorax as an aid to return to work.

(41) Persistently positive sputum after recovery of all other signs after sanatorium treatment should be submitted to pneumothorax, so as to avert two dangers:
(*a*) Spread or recrudescence
(*b*) Infectivity.

(42) In phthisis complicated by pregnancy which has already passed the 16th week, little is gained by operative termination and if the disease is unilateral, pneumothorax is indicated.

(43) If pneumothorax is contemplated on one side, there should not be involvement in disease greater than one-third of the opposite lung, especially apical.

(44) Ideal of pneumothorax is complete collapse of the whole lung *without displacement of the mediastinum.*

(45) Routine things to be done in pneumothorax treatment:
(1) Examination of sound lung

(2) Repeated skiagrams
(3) Repeated sputum examinations.

(46) Never give a second refill until general reaction from previous one has completely subsided.

(47) Until collapse is established, screening should be done before and after every refill.

(48) Guide for refill is the optimum intrapleural pressure and not the amount of air. It should be slightly negative in earlier stages.

(49) More than 600 c.cs. or less than 200 c.cs. of air required at a refill are abnormal and show that refills are too slow or too rapid.

(50) The most frequent cause of failure to obtain a complete collapse of the lung is the presence of pleural adhesions.

(51) An average total period of two and a half to three years of collapse should be maintained in artificial pneumothorax.

(52) Stage of re-expansion is most critical and requires close observation for reappearance of clinical or X-Ray evidence of recrudescence.

(*b*) **Phrenicectomy:**

(53) Three ways of phrenic procedure:
(1) Crushing . regeneration within 4–6 months
(2) Section
(3) Avulsion:
: Together with section of nerve to the subclavius.

(54) Phrenicectomy diminishes basal aspiration and is indicated in apical lesions also.

(55) Avulsion of phrenic nerve:
(*a*) Adjunct to pneumothorax
(*b*) Preliminary to thoracoplasty
(*c*) Palliative for: (α) Cavity
(β) Hæmoptysis
(γ) Toxæmia
(δ) Pleural pain.

(*c*) **Thoracoplasty:**

(56) Surgical treatment (thoracoplasty) of pulmonary tuberculosis is only to be considered after failure of or non-application of artificial pneumothorax; but must be in good time and not too long deferred.

(57) Patients with unilateral or largely unilateral disease, in whom pneumothorax is unsatisfactory, can be cured by complete or partial thoracoplasty, alone or combined with pneumothorax or phrenicectomy. The procedure

is more successful in chronic productive forms than in purely exudative, and is indicated when sanatorium treatment of three or four months does not lead to improvement, and especially in the presence of cavities and repeated hæmoptysis.

(58) Chief factor influencing the choice of a case for thoracoplasty is the condition of the better lung, active disease of which, except at the apex, is a definite contraindication.

(d) ***Miscellaneous:***

(59) Sequence of procedures in T. B. lungs:
- (1) Phrenic avulsion
- ↓ (2) Pneumothorax
- ↓ (3) Thoracoplasty

(60) X-Ray in phthisis:
- (a) Soft, fluffy shadows with ill defined edges:
  ∴ Active disease
- (b) Linear, dense, sharply defined shadows:
  ∴ Old inactive disease.

(61) Every care should be taken to rule out phthisis, even quiescent, before giving a general anæsthetic and avoid ether if it has to be given.

(E) Tumours of the bronchi and lungs:

(62) Bronchiectasis and congenital cystic disease of the lungs simulate each other.

(63) Pulmonary neoplasm ranks in frequency only after carcinoma of the
- (a) Stomach
- (b) Breast
- (c) Uterus
- (d) Œsophagus.

(64) All carcinomas of the lung arise in the deep layers of the bronchial or bronchiolar mucosa.

(65) 80% of carcinoma lung arise in larger bronchi.

(66) Pathological groups of lung carcinoma:
- (1) Main stem bronchial carcinoma
- (2) Peripheral carcinoma.

(67) Dry spasmodic cough with viscid pearly sputum tinged with blood in a male over 40 years of age with no tuberculosis or other reasonable cause of cough, should lead to the suspicion of pulmonary carcinoma.

(68) One-third of lung carcinomas may commence as acute respiratory infection:
∴ Pain + cough + dyspnœa + sputum with or without blood + rigors with pyrexia.

(69) Most common complaints in bronchial carcinoma:
   (a) Cough
   (b) Chest pain
   (c) Dyspnœa
   (d) Expectoration with or without hæmoptysis
   (e) Chest catarrh.

(70) Any unexplained cough in a middle aged patient:
   ? Carcinoma lung.

(71) Any middle aged patient, free from tuberculosis, reveals atelectasis of one lobe on X-Ray:
   ? Carcinoma bronchus.

(72) All patients with persistent cough after middle age:
   (1) Take X-Rays
   (2) Do bronchoscopy.

(73) Dyspnœa, pain, expectoration, hæmoptysis and pleural effusion are the five main clinical features of carcinoma lung.

(74) Every patient with hæmoptysis, bronchial obstruction or pleural effusion, should be most carefully examined to exclude carcinoma of the lung.

(75) Slight pyrexia with weakness and breathlessness in a person past middle age:
   ? Carcinoma lung.

(76) Later stages of lung carcinoma:
   (1) Supraclavicular adenopathy
   (2) Phrenic paralysis
   (3) Mediastinal involvement.

(77) In every case of malignancy anywhere, X-Ray the chest for secondaries.

(78) Dissection of the hilum is better than tourniquet method in pneumonectomy for carcinoma lung.

(F) Bronchiectasis:

(79) The chief etiology of acquired bronchiectasis is any lung pathology especially valvular bronchial obstruction.

(80) Cough, fœtor and chronic toxæmia are the chief symptoms of bronchiectasis.

(81) Postural drainage is the best form of conservative and preoperative treatment in bronchiectasis.

(82) Lobectomy is the operation of choice for unilateral bronchiectasis.

CHAPTER III

SURGERY OF THE PLEURA

THE PLEURA

(1) PLEURODYNIA :

Clinic : (a) Malaise and fever
(b) Excruciating pain in chest : on
(α) Deep breathing
(β) Coughing
(γ) Straining
(δ) Laughing
or (c) Pain in precordial area
or (d) Pain in abdominal wall

Diff. diag : (1) Acute chest conditions : in adults
(2) Acute abdomen : in children
(3) Coronary thrombosis and angina
(4) Herpes Intercostalis

(2) PLEURISY :

(A) **Dry pleurisy :**

Clinic : (1) Intercostal pain on : (α) Deep respirations
(β) Straining
(2) Friction rub

Compl : (a) Pleural effusion or adhesions
(b) Lung complications

Treat : (1) Strapping
(2) Artificial pneumothorax

(B) **Pleurisy with effusion :**

Etio : (1) Non-inflammatory : passive effusion
(2) Inflammatory : (a) Acute
(b) Insidious : tuberculous

Clinic : (1) **Symptoms of intrathoracic pressure :**
(a) Dyspnœa
(b) Cardiac trouble
(2) **Signs of fluid in the chest :**
(a) Wooden dullness
(b) Absent breath sounds
(3) **Signs of displacement of neighbours :**
(a) Fuller chest wall
(b) Displaced heart and mediastinum
(c) Lowered diaphragm and liver
(4) **Signs of general toxæmia :** In acute ca

Signs: (1) **X-Ray:**
(*a*) Uniform opacity with invisible diaphragm
(*b*) Displaced thoracic viscera
(2) **Aspiration**

Treat: **Aspiration:** With oxygen replacement (200 c.cs.)

Post. compl: (1) Shock and pleural reflex
(2) Trauma to the lung
(3) Infection: empyema
(4) Acute œdema or failure of re-expansion of lung

(3) PNEUMOTHORAX:

Def: Presence of gas in pleural cavity

Etio: (1) **Therapeutic:** (*a*) Phthisis
(*b*) Pleurisy
(*c*) Effusion
(2) Diseases of the lung: **Phthisis**
(3) Operations on chest: **Thoracotomy**
(4) **Traumatic:** Stab wounds

Varieties: (A) **Open:**

Etio: (*a*) Trauma: stab wounds
(*b*) Operations. thoracotomy

Compl: (*a*) Flapping mediastinum
(*b*) Infection

(B) **Closed:**

Etio: Therapeutic

(C) **Ingravescent valvular:**

Etio: (1) **Lung conditions:**
(*a*) Ruptured T.B. focus
(*b*) Ruptured emphysema
(*c*) Stab wound lung
(*d*) Lobectomy
(2) **Trauma of the chest:**
: Sucking wounds of chest wall

Clinic. Rapid, progressive and extreme clinical course

Clinic: (1) **History:** of (*a*) Respiratory strain
(*b*) Artificial pneumothorax
(2) **Initial** symptoms: shock; pain
(3) **Pressure symptoms:**
(*a*) **Respiratory:** Dyspnœa
: Cyanosis
(*b*) **Cardiac:** Tachycardia
(4) **Local signs:**
(*a*) **Air in thorax:** Hyper-resonance
: Faint breath sounds
(*b*) **Displaced neighbours:** Lung, heart

Special signs:
- (1) **X-Ray:**
  - (a) Abnormal lighting of air
  - (b) Collapse of the lung
  - (c) Displaced heart, mediastinum and diaphragm
- (2) **Aspiration**

Compl:
- (1) Collapse of the lung
- (2) Flapping mediastinum: in open variety
- (3) Cardiac displacement

Treat:
- (A) **Prophylactic:**
  - (1) **Turn the sucking wounds into non-sucking:**
    - : By airtight closure: (α) Temporary
      - (β) Permanent
  - (2) Positive pressure anæsthesia:
    - : In chest operations
  - (3) Traction on the lung towards the wound
- (B) **Therapeutic: Aspiration**
  - Ind:
    - (a) Extreme dyspnœa
    - (b) Flapping mediastinum
    - (c) Cardiac irregularity

(4) HÆMOTHORAX:

Def: Collection of blood in pleural cavity

Etio:
- (1) **Trauma:** Stabs, gunshot wounds
- (2) **Aneurysmal rupture**
- (3) **Back pressure:** (a) Carcinoma lung or pleura
  - (b) Cirrhosis liver
- (4) **Blood diseases:** Scurvy, purpura

Clinic:
- (1) **History:** Of etiology
- (2) Presence of etiological factor
- (3) **Respiratory → cardiac distress**
- (4) Signs of **pleural effusion:**
  - (a) Local: collection of fluid
  - (b) Displaced thoracic viscera:
    - (α) Lung
    - (β) Heart
    - (γ) Diaphragm
    - (δ) Liver
- (5) Signs of **internal hæmorrhage:** If acute
- (6) Absorption **toxæmia:** (a) Acute
  - (b) Chronic

Signs:
- (1) **X-Ray:** As in pleural effusion
- (2) **Aspiration**

Compl:
- (1) **Collapse of the lung**
- (2) **Empyema** (Infection)
- (3) **Shock and collapse**
- (4) Blood toxæmia

Treat: (A) **Passive**: Morphia
: Anti-shock treatment
: Coagulants

(B) ***Active***:

Ind: (1) **Post-traumatic**
(2) **Acute pressure signs**
(3) **Acute progressive hæmorrhage**:
(*a*) General signs of hæmorrhage
(*b*) Steady fall in B.P.

Tech: (1) **Recent hæmothorax**: Within 5 days
: **Aspiration** with oxygen replacement
(2) **Incompletely absorbed hæmothorax**:
: (*a*) **Intercostal incision**
↓ (*b*) Removal of clot
↓ (*c*) Evacuation of blood
↓ (*d*) Oxygen replacement
(3) **Infected hæmothorax**:
: (*a*) **Rib resection**
↓ (*b*) Drainage

(5) (A) HYDRO }
(B) HÆMO } -PNEUMOTHORAX:
(C) PYO }

Def: Gas with serum, blood or pus in pleural cavity

Etio: (1) **Phthisis**: Hydro or pyo-pneumothorax
(2) **Trauma**: Hæmo-pneumothorax
(3) **Abscess lung**: Pyo-pneumothorax

Clinic: (1) ***Respiratory distress***: Pressure symptoms
(2) **Local signs**:
(*a*) Pleural contents: (α) Air
+ (β) Fluid
(*b*) Displaced thoracic viscera:
: Lung, heart, diaphragm, liver
(3) [illegible] ions

Signs: (1) **X-Ray**: **upper level horizontal**
(2) **Aspiration**

Treat: As in hydro, hæmo or pyothorax

(6) CHYLOTHORAX:

Etio: (1) **Thoracic duct**: (*a*) Trauma
(*b*) Obstruction
(2) **Malignancy**: (*a*) **Primary**: Pleura or lung
(*b*) **Secondary**: Breast

Clinic: As in pleural effusion

Compl: (1) Inanition cachexia: loss of lymph
(2) Infection: empyema

(7) PYOTHORAX: EMPYEMA

Def: Collection of pus in pleural cavity

(A) ACUTE EMPYEMA:

Etio: Males; children

Sources: (A) **Primary:**
- (*a*) **Lung affections:**
  - (1) **Pneumonia:** 75%
    - (α) Syn-pneumonic
    - (β) Meta-pneumonic
  - (2) **Phthisis:** 10%
  - (3) Infarction
  - (4) Abscess
- (*b*) **Blood infection:**
  : Streptococcal **septicæmic**
- (*c*) **Traumatic**
- (*d*) **Secondary infection:**
  : Of aseptic pleural collections

(B) **Secondary:** Extension from neighbours
- (1) **Mediastinum:**
  - (*a*) Osteomyelitis vertebra
  - (*b*) Œsophagitis
  - (*c*) Cervical cellulitis
- (2) **Abdomen:**
  - (*a*) **Subphrenic abscess**
  - (*b*) **Liver abscess**

Bacteriology: (1) **Pneumococcal:**
- Etio: Lobar pneumonia
- Path: Meta-pneumonic
- Clinic: (*a*) Early thickening of pus
  - (*b*) Greenish yellow
  - (*c*) Less toxæmia
  - (*d*) More local fibrosis

(2) **Streptococcal:**
- Etio: (*a*) Broncho-pneumonia
  - (*b*) Septicæmia
- Path: Syn-pneumonic
- Clinic: (*a*) Thin pus
  - (*b*) Greenish brown
  - (*c*) More toxæmia
  - (*d*) Less local fibrosis

(3) **B. coli:**
- Etio: Sub-diaphragmatic abscess

(4) **B. tuberculosis:**
- Etio: Phthisis

(5) **Anærobic bacilli :**
Etio : Gangrene lung
Clinic : Fœtid smell

Sites : (1) **Bilateral** total
(2) **Unilateral** total
(3) Partial or **localised :**
(a) **Inter-lobar**
(b) **Apical**
(c) Diaphragmatic or **infra-pulmonary :**
(α) Internal : (mediastinal)
: No connection with thoracic wall
(β) External :
: Contact with thoracic wall
(γ) Combined

Clinic : (1) **Etiology :** Pneumonia
: Phthisis
: Trauma
(2) **Respiratory distress :** Dyspnœa
(3) **General toxæmia :** Acute,
: Chronic
: Latent
(4) **Pleural effusion :**
(a) Fullness of the chest contour
(b) Diminished respiratory mobility
(c) Dull note
(d) Absent breath sounds
(e) Displaced thoracic viscera

Clinical varieties:
(A) { (1) **Syn-pneumonic :** Septicæmic
(2) **Meta-pneumonic :** Unresolved pneumonia
(B) { (3) **Primary :** Sequela to chest diseases
(4) **Secondary :** Sequela to upper abdominal sepsis
(C) { (5) **Acute :** [illegible]
(6) [illegible]
(7) [illegible]
+ Accidental finding of local signs
(D) (8) **Empyema necessitatis :**
: As a differential diagnosis of thoracic wall abscess

Signs : (1) **Aspiration :** Examination of the fluid :
(a) Physical
(b) Cytological
(c) Bacteriological
(2) **X-Ray :**
(A) **Pleural effusion :**
(a) Uniform shadow
(b) Obliteration of diaphragmatic outline

(c) Upper margin concave up and in

(B) **Displacement of thoracic viscera**

Diagnostic features:

(1) *Respiratory distress* out of all proportion to the course of pneumonia
(2) Persistence of symptoms and signs of pneumonia after crisis: *Absence of crisis*
(3) *Recrudescence* of hectic temperature some days after crisis in pneumonia
(4) *Pleural effusion* ⇄ general septic toxæmia
(5) Unaccounted chronic toxæmia with progressive *emaciation*
(6) *Cold abscess* in thoracic wall

Diff. diag: (1) **Pleural effusions:**
- (a) Pleurisy with effusion
- (b) Hæmothorax
- (c) Pneumothorax
- (d) Chylothorax

(2) **Lung consolidations:**
- (a) Pneumonia
- (b) Abscess
- (c) Collapse

(3) **Pericardial effusions**

(4) **Sub-diaphragmatic or liver abscesses**

(5) **Parietal cold abscesses:**
- (a) Spine
- (b) Rib
- (c) Sternum
- (d) Breast
- (e) Lymph glands

Complications:

(1) **General toxæmia:** Acute, chronic, latent

(2) **Pressure:** On neighbours
- (a) Lung: collapse
- (b) Heart & mediastinum

(3) **Rupture:** Into
- (a) **Bronchus:** Pleuro-bronchial fistula
- (b) Pericardium
- (c) Œsophagus or stomach
- (d) **External thoracic wall**
- (e) Psoas sheath

(4) **Metastases:** Cerebral abscess

Treatment:

Aims: (1) **Relief of intrathoracic pressure**

(2) **Reduction of toxæmia:** By evacuation of pus

(3) Closure of the cavity
(4) Restoration of the function of the lung

Principles: (1) Thin pus: (*a*) Repeated aspirations:
: (till thick)
↓ (*b*) Thoracotomy and evacuation
(2) Thick pus:
: Immediate thoracotomy and evacuation

Techniques: (A) Intermittent closed drainage:
: Aspirations: With or without gas replacements
(B) Continuous closed drainage:
(*a*) Intercostal catheter
(*b*) Costal drain
(C) Open drainage:
(*a*) Rib resection with wide bore tube
(*b*) Free intercostal opening with packs

Drainage: (1) Intermittent: Repeated aspirations
(2) Continuous:
(A) Closed: (*a*) Ordinary
(*b*) Suction
(B) Open

Pretreatment requisites:
(1) Good X-Ray
(2) Aspiration

Operations: (A) *Aspiration*:
: With or without oxygen replacement
Ind: (1) Diagnosis: (*a*) Of the condition
(*b*) Of the nature of the fluid
(2) Therapeutic:
(*a*) Syn-pneumonic with acute toxæmia
(*b*) Thin sanious pus
(*c*) Marked pressure symptoms
(*d*) Bilateral empyemata
(*e*) Early stages
(*f*) Infants and children
(*g*) Streptococcal empyema
Tech: (1) Different pricks at every time
or (2) Small intercostal incision kept open
Sites: (1) Centre of maximum dullness
(2) X-Rays
Time: (1) Appearance of pressure symptoms
(2) Every 3 or 4 days

(B) Closed continuous drainage:
Ind: (*a*) All therapeutic indications of aspiration
\+ (*b*) Failure of repeated aspirations
Tech: (1) Intercostal drainage:

Ind : (*a*) Children under six
(*b*) Desperately ill patients

Tech : (1) Local infiltration anæsthesia :
: Skin and pleura
(2) Small intercostal incision :
(*a*) Near post. axillary line
(*b*) Dependant position
(3) Insertion of trocar and cannula
(4) Introduction of self-retaining catheter
(5) Withdrawal of cannula
(6) Collodion sealing of the incision
(7) Connection to suction apparatus

Compl : (*a*) Accidental displacement of tube
(*b*) Blockage
(*c*) Contact with diaphragm
(*d*) Cellulitis chest

(2) **Costal drainage :**

Ind : (1) Failure of repeated aspirations
+ (2) Adults

Tech : (1) Rib resection
↓ (2) Water-tight closure : by
(*a*) Stitching
(*b*) Vaseline gauze
(*c*) Adhesive plaster

(C) **Open drainage by rib resection :**

Ind : (*a*) Meta-pneumonic with no toxæmia
(*b*) Thick pus
(*c*) Pressure symptoms not marked
(*d*) **Failure of aspirations and closed drain**
(*e*) After 3 weeks from onset
(*f*) Adults

Pre-oper : (1) X-Ray
(2) Aspiration
(3) Morphia : if no cyanosis

Anæsth : (1) General : evipan
(2) Local infiltration : 1% novocain
(*a*) Skin and subcut. tissues
↓ (*b*) Muscles + intercostal bundle
↓ (*c*) Periosteum
↓ (*d*) Intercostal nerve :
(α) Rib above
(β) Rib to be excised
(γ) Rib below
↓ (*e*) Pleura

Position: (1) Prone
(2) **Sitting**
(3) Lateral:
(a) Affected side uppermost
(b) Affected side lowermost

Sites: (1) **Rib immediately below the inferior angle of the scapula,** palpated with the arm by the side
(2) **Lowermost limit:** As shown by X-Ray
(3) **8th or 9th rib in scapular line**
(4) **7th or 8th rib in mid-axillary line**

Steps: (1) Incision:
(a) Parallel to and over the rib
or (b) **Vertical with rib as mid point**
(2) Stripping of periosteum and intercostals
(3) Excision of the rib: 2 to 4 inches
(4) Resection of the intercostal bundle
(5) Aspiration
(6) Incision of posterior periosteum
(7) Hilton's method: opening of pleura
(8) Control over the sudden decompression
(9) Finger exploration of the cavity:
(a) Extent
(b) Coagula
(c) Adhesions: (locula)
(d) Condition of lung
(e) **Dependant pocket**
(10) Fresh lower rib resection:
. If drainage is not dependant
(11) Drainage:
: Short, flanged and fenestrated rubber tube of ½ inch diameter
(12) Air-tight closure:
. With fixation of the tube to chest wall

Post-operative management:

(1) **Position:**
(a) Sitting or propped up
(b) Lateral with tilting on affected side

(2) **Dressings:** Twice a day
: Protection of skin by vaseline

(3) **Drainage:**
(A) **Suction drainage: Siphon**
: Closed drainage attached to siphon arrangement
(B) **Closed drainage: Water-tight**
: Water-tight drainage into a closed sterile glass bottle under an antiseptic fluid

: **Clamp the tube when bottle is being changed**

(C) **Open drainage:**

(α) Change the tube every seven days

(β) Reduce the size when:

(1) Cavity is clean

(2) Cavity capacity less than 100 c.cs.

(ϒ) Remove the tube gradually: when

(1) Discharge is less and serous

(2) Within 2 to 4 weeks

Advantages and disadvantages of drainage methods:

(A) Closed drainage:

Advant: (*a*) Prevention of lung collapse

(*b*) Gradual decompression

(*c*) Prevention of secondary infection

(*d*) Cleanliness of dressings

Disadvant: (*a*) Blocking of drainage

(*b*) Ultimate inadequacy

(B) Suction drainage:

Advant: (*a*) All advantages of closed drain

\+ (*b*) Help to re-expansion of lung

\+ (*c*) Better drainage

Disadvant: Difficulty in keeping air-tight

(C) Open drainage:

Advant: (*a*) Easy and unblocked drainage

(*b*) Irrigations possible

(*c*) Succeeds where closed drain fails

Disadvant: Failure of re-expansion of lung

(4) Irrigations:

Ind. (1) Fibrin blocking

(2) Fibrin deposits in the cavity

(3) Foul discharge

Contraind: (1) Within five days of operation

(2) Broncho-pleural fistula:

: Violent cough on introduction of fluid

luids. (1) Normal sterile saline

↓ (2) Dakin or eusol

Tech: (1) Catheter and funnel method.

(*a*) Run in the fluid from 18" height

↓ (*b*) Keep in for 10 minutes

↓ (*c*) Roll over and let it escape

(2) Two tubes technique: (*a*) Inlet smaller tube: upper

(*b*) Outlet larger tube: lower

Frequency: (1) Begin 2 to 5 days after operation

↓ (2) B. D.

↓ (3) Once a week

(5) Bier's cupping glass:

Ind: Open drain

Frequency: Start on third day, twice a day

(6) **Positive—pressure breathing exercises:**

Time: 48 hours after operation

Tech: (*a*) Deep breathing
(*b*) Wind instruments
(*c*) Woulfe's bottle
(*d*) Co_2 inhalations

Operative complications:

(1) **Shock** and pleural syncope

(2) **Respiratory embarrassment**

(3) Unrestrained **cough**

(4) **Intercostal hæmorrhage:**

Treat: Tie a ligature around the rib with gauze between its loop and the posterior surface of the rib
↓ Cut the ligature and remove the gauze after 48 hours.

(5) **No pus on pleural opening:**

Causes: (*a*) Localised empyema
(*b*) Inter-lobar empyema
(*c*) Lung abscess

Treat: Explore by finger and needle
↓ Drain at appropriate level

(6) **Inadequate drainage:**

Causes: (*a*) Too high
(*b*) Too low

Treat. Resection at the appropriate level

(7) **Inadvertent transpleural laparotomy:**

Cause: Too low opening

Treat: Repair the incision in the diaphragm:
. Before empyema is opened

Special varieties of empyema.

(1) Infra-pulmonary empyema:

Def. Encapsulated pus between the base of the lung and the diaphragm

Varieties: (1) Internal: no contact with parietes
(2) External: in contact with parietes
(3) Combined: secondary contact with parietes

Clinic: (1) All signs of empyema
(2) Special signs:
(*a*) Pain: shoulder, lower chest and upper abdomen
(*b*) Marked cardiac displacement
(*c*) X-Ray
(*d*) Aspiration

Treat. Drainage in one or two stages

(2) Inter-lobar empyema } clinic: of lung abscess
(3) Mediastinal empyema } Treat: two stage drainage

(4) Bilateral empyema:

Clinic: Extreme bilateral symptoms and signs

Treat: (1) Bilateral balancing aspirations:
- (a) Simultaneous
- or (b) Two stage

↓ (2) (A) Unilateral intercostal drainage
+ (B) Contralateral aspirations

↓ (3) Bilateral intercostal drainage

↓ (4) (A) Unilateral costal drainage
+ (B) Contralateral intercostal drainage

↓ (5) Bilateral costal drainage

(B) CHRONIC EMPYEMA:

Def: Chronic collection of pus in the persistent cavity between visceral and parietal layers of the pleura, due to failure of both the layers to come into contact with each other, the following factors being absent:

- (a) Re-expansion of the lung
- (b) Mediastinal replacement
- (c) Diaphragmatic elevation
- (d) Indrawing of the chest parietes

Etio: (1) **Primary or Insidious: Tuberculosis**
- (a) Primary tuberculous empyema
- (b) Infected tuberculous effusion

(2) **Secondary:**
- (a) Secondary **infection of pleural effusions**
- (b) Secondary to **acute empyema**

Def: Failure of empyema wound to heal:
: Within two months

Causes: (1) **Failure of early diagnosis**

(2) **Failure of early treatment**

(3) **Faulty treatment:**
- (a) Too early drainage
- (b) Too late drainage
- (c) Misplaced drainage
- (d) Imperfect drainage
- (e) Non-drainage of a loculus

(4) **Faulty after-treatment:**
- (a) Too short drainage
- (b) Too long drainage

(5) **Mechanical causes:**
- (a) Parietes:
  - (α) Inelasticity & thickeni
  - (β) Osteitis of a rib
- (b) Cavity:
  - (α) Foreign body
  - (β) Failure to obliterat

(c) Visceral wall:
  (α) Pulmonary collapse
  (β) Thickened visceral pleura
  (γ) Broncho-pleural fistula

(6) **Nature of infection:**
  (a) Tuberculosis
  (b) Lung infection
  (c) Actinomycosis
  (d) New growth

Path: (1) Thickening and fibrosis → rigidity:
: Of the walls of the cavity
(2) Persistence of the cavity
(3) Persistence of the discharge
(4) Persistence of the thoracotomy sinus
(5) Chronic toxæmia

Clinic: (1) **Insidious or Primary:**
  (a) **Latent:**
    (α) Chronic toxæmia
    ↓ (β) Accidental find of pleural effusion
  (b) Empyema **necessitatis**

(2) **Secondary:**
  (a) Failure of acute empyema drainage wound to heal within two months
  (b) **Persistent sinus discharging pus:**
    (α) Thoracotomy
    (β) Pleuro-bronchial
  (c) Respiratory toxæmia:
    (α) Dyspnœa with cyanosis
    (β) Emaciation
    (γ) Clubbed fingers

Signs: (1) **X-Rays:** (a) Plain
  (b) Lipoidol: (α) Tracheal
    (β) Parietal sinus
(2) Examination of the discharge

Diff. diag: (1) **Any chronic respiratory disease:**
  (a) Bronchi
  (b) Lungs
  (c) Pleuræ

(2) **Any cause of chest abscess or sinus:**
  (a) Bone abscess
  (b) Lymph gland abscess
  (c) Breast abscess
  (d) Gumma
  (e) Tuberculosis
  (f) Actinomycosis

(3) **Any cause of chronic toxæmia**

Diagnostic points:
(1) **History of acute empyema :**
: With persistent thoracotomy sinus
: (For more than 8 weeks)
(2) **Phthisis complicated with pleural effusion**
(3) **Any abscess in the thoracic parietes**
(4) **Chronic respiratory toxæmia**

Compl: (1) **Chronic toxæmia:**
: With amyloid disease and exhaustion
(2) **Deformity** chest: scoliosis
(3) Pleuro-bronchial fistula
(4) Lung-infection
(5) Brain abscess
(6) **Pus or air embolism**

Treatⁿ: (A) If an ordinary empyema is discharging pus after 4 weeks and is not healed at the end of 8 weeks:
Treat: **Investigate the cause and remove it**
↓ (B) If no improvement:
Treat: **Drain adequately:** For at least 4 months
↓ (C) If no improvement:
Treat: **Radical operations:**

Pre-operative: **Good X-Ray plates**

Operations: (A) **Conservative:**
(1) **Exploration → removal of etiology → disinfection → drainage:**
(*a*) Resection of a rib
(*b*) Thorough exploration
(*c*) Removal of the underlying cause
(*d*) Open drainage
↓ (2) **Pleural wash-outs:**
Time. Once or twice a week
Tech: **Two needles:**
(*a*) One in 2nd interspace
(*b*) Other at the bottom of the cavity
Fluid: Dakin's solution
Method: Run in the solution from upper needle
↓ Withdraw by the lower needle
Position: Sitting
+ (3) **Positive pressure respiratory exercises**
(B) **Radical:** Closure of the cavity
(1) **Operations on visceral pleura:**
Ind: Failure of pleural irrigations
Tech: (A) **Delorme: Decortication**
(*a*) Freely expose the cavity
(*b*) Incise thick visceral pleura

(c) Dissect the pleura off the lung

(B) **Ransohoff : Discission**

: Division of visceral pleura into ¼" squares upto the lung

(2) **Operations on thoracic parietes :**

(A) Extrapleural pneumolysis

(B) **Thoracoplasty :**

Ind : (a) *Failure of adequate drainage*

(b) Failure of pleural irrigations

(c) Failure of decortication

(d) Persistence for 4 months

Tech : (1) *Local or regional :*

(a) **Estlander :**

: Subperiosteal removal of overlying parts of ribs

(b) **Schede :**

Removal of : (α) Ribs with periosteum

(β) Muscles

(γ) Parietal pleura

(2) *Extensive or total :*

(a) **Brauer :**

: **(Decostalisation)**

: Removal of entire lengths of ribs from 2nd to 11th

(b) **Sauerbruch :**

: **(Paravertebral extrapleural thoracoplasty)**

: Extrapleural subperiosteal resection of first eleven ribs, for 1 to 6 inches from the tips of transverse processes, in two stages, the periosteum being mopped with 10% formalin or Zenker's solution

(c) **Wilms :**

: **(Rib mobilisation)**

· (α) Sauerbruch

+ (β) Costal cart. excision

Indicative treatment of chronic empyema :

(1) Small recent cavity :

(a) Exploration

↓ (b) Removal of etiology

↓ (c) Free drainage

↓ (d) Irrigations : (if necessary)

(2) Small long-standing cavity:
 (a) Removal of overlying ribs
 ↓ (b) Mobilisation and approximation of pleura
 ↓ (c) Drainage

(3) Moderate sized cavity:
 (a) Exploration + drainage + irrigations
 ↓ (b) Rib resection + decortication

(4) Large sized cavity:
 (a) Endoscopic exploration + drainage + irrigations
 ↓ (b) Schede thoracoplasty + decortication

(5) Cavity + pleuro-bronchial fistula:
 (a) Exploration + free drainage
 ↓ (b) Closure
 + (c) No irrigations

(1) **Tuberculous empyema:**

Cause: *Artificial pneumothorax*

Groups: (1) **Primary:** No associated pulmonary lesion
 (2) **Secondary:** Etiological pulmonary lesion
 (3) **Complicated:** Secondary infection

Treat: (1) **Injection of Gauvain's fluid → aspiration → air replacement**
 ↓ (2) **Pleural irrigations:**
 With: Saline, methylene blue, acriflavine, iodine sol. (zi to 01.)
 Time: Once every week.
 ↓ (3) **Closed intercostal drainage:** *10th interspace*
 ↓ (4) **Phrenic avulsion + thoracoplasty**

Indicative treatment of tuberculous pleural effusion:

(A) Clear serous fluid:
 (a) Aspiration
 ↓ (b) Gas replacement

(B) Purulent non-infected tuberculous effusion:
 (a) Aspiration with or without gas replacement
 (b) Pleural irrigations
 (c) Oleo or gelatino-thorax
 (d) Obliteration of the cavity:
 Ind: (α) Controlled sepsis
 (β) *Good general condition*
 Tech: (α) Multi-staged paravertebral thoracoplasty
 + (β) Phrenic avulsion

(C) *Purulent mixed pyogenic effusion:*
 (a) Rib resection
 ↓ (b) Closed or open drainage

(2) Recurrent empyema:

Cause: Incomplete healing of primary cavity

Time: Few weeks to many years.

Clinic: (1) History of past empyema
(2) Chest symptoms
(3) Inflamed drainage scar
or (4) Empyema necessitatis
Sign: Aspiration in the neighbourhood of or through the scar
Treat: (1) Aspiration
↓ (2) Open drainage
↓ (3) Thoracoplasty

(8) NEW GROWTHS OF THE PLEURA:

(A) **Innocent:**
(1) Lipoma
(2) Fibroma
(3) Angioma

(B) **Malignant:**
(1) Endothelioma: (*a*) Single
(*b*) Multiple scattered
(*c*) Diffuse infiltrating
(2) Sarcoma
(3) Carcinoma: secondary to (*a*) Lung
(*b*) Breast
(*c*) Œsophagus
(4) Melanoma: secondary metastases

Clinic: Blood-stained pleural effusion

(IX) IMPORTANT POINTS

(A) **Pneumothorax:**

(1) Pneumothorax checks bleeding and is auto-absorbed and so should not be interfered with unless there is urgent dyspnœa.

(B) **Empyema:**

(2) Most common cause of acute empyema is pneumonia and the most common infection is by pneumococcus.

(3) Allison's groups of empyema: (Med. Ann. 1939)

(1) Simple: Etio: Pneumococcus
Path: Lung expansile
Clinic: (*a*) Pleuritic pain } simultaneous
(*b*) Febrile attack }
Treat: Drainage

(2) Complicated: Etio: Streptococcus
Path: Lung unexpansile
Clinic: (*a*) Febrile attack
↓ (*b*) Pleuritic pain
Treat: Thoracic collapse.

(4) Main clinical groups of empyema:
(1) Respiratory disease

(2) General toxæmia:
(a) Active
(b) Passive
(3) Local chest wall suppuration.

(5) Main danger of syn-pneumonic empyema is exhaustion.

(6) Main principles in the treatment of acute empyema:
(1) Avoidance of open pneumothorax in early stages
(2) Prevention of chronicity by sterilisation and obliteration of the cavity
(3) Raising of general resistance.

(7) Main methods of treatment of acute empyema:
(1) Aspiration: (a) Young age
(b) Early stage with thin pus
(c) Extensive cases with bad condition
(2) Intercostal drain: (a) Acute condition in children
(b) Failure of aspirations
(3) Rib resection: (a) Adults
(b) Failure of aspirations
(c) Stabilisation of condition.

(8) In empyema, from treatment point of view, it is most mportant to decide the consistency of pus:
(1) Thin pus: repeated aspirations
(2) Thick pus: evacuate at once and freely.

(9) In acute empyema:
(1) Bad, extensive, early cases:
Treat: (a) Aspirations
↓ (b) Closed drainage
(2) Local cases with stabilisation of general condition and failure of closed drainage:
Treat: Rib resection with open drainage.

(10) In acute empyema:
(a) Syn-pneumonic: (1) Repeated aspirations
↓ (2) Intercostal closed drainage
↓ (3) Costal closed drainage
↓ (4) Costal open drainage
(b) Meta-pneumonic: (1) Costal closed drainage
↓ (2) Costal open drainage

(11) No case of empyema should be operated upon in syn-pneumonic stage. Delay well into the meta-pneumonic stage, employing aspirations in the waiting period.

(12) Small localised empyemata respond to aspiration treatment but if the quantity of pus does not diminish appreciably after five punctures, a rib resection is indicated. If the state of the patient does not permit of repeated aspirations or if the pus is so thick th[illegible] cannot be aspirated, an intercostal cannula drai

should be instituted and when the general condition has improved, rib resection should be carried out. In large [illegible]

(13) During formative period of empyema, aspiration or closed intercostal drainage is the treatment; but when definite localisation has taken place, whichever preliminary method is employed should be replaced at the *appropriate moment by* rib resection and drainage.

(14) Interval between the onset of streptococcal pneumonia and the development of frank pus is from 2 to 3 weeks and on an average four aspirations are required.

(15) Take care of lung in every case of aspiration of any pleural effusion.

(16) Closed inter-costal drainage is the choice in:
  (*a*) All early acute cases
  (*b*) All severe and extensive cases
  (*c*) Infants.

(17) If a specimen of pus is left in a test tube and a sediment of three quarters of its volume remains after 24 hours, the pleura should be drained

(18) *Thoracotomy should be delayed until the aspirating* needle withdraws frank thick pus, nine-tenths of which becomes solid after standing overnight.

(19) When the organism present is a pneumococcus, thick pus must be present for a week before drainage is undertaken. When the organism is streptococcus thick pus must be present for at least ten days.

(20) Thoracotomy should not be carried out until:
  (*a*) Effusion is localised
  (*b*) Mediastinum is fixed

  Aspiration should be the first line of treatment in early *cases while thoracotomy should be reserved for cases* in which aspirations have failed.

(21) In children the most successful method of treatment is by rib-resection performed immediately after localisation of the empyema has been achieved by repeated aspirations.

(22) If empyema pus is *fœtid* on *diagnostic aspiration:*
Causes: (1) Gangrene or abscess lung
  (2) Communication with abdominal viscera
  (3) *Anærobic infection*
Treat: Immediate operative drainage

(23) Immediate operative drainage is also indicated in infected *traumatic hæmothorax.*

(24) In resection of a rib for empyema drainage, choose not the lowest true rib, but one just clear of the scapula with arm at the side.

(25) A pleural empyema must be gradually decompressed.

(26) Special methods in the after-treatment of empyema:
- (a) Closed drainage:
  - (α) Simple
  - (β) Suction
- (b) Pleural irrigations.

(27) Closed drainage is used for about 14 days, when open drainage is substituted unless X-Ray shows non-expansion of the lung.

(28) Empyema can be said to have healed, only when visceral and parietal pleuræ are in close apposition obliterating the whole of the cavity permanently.

(29) Factors in mortality:
- (a) Virulence of preceding pneumonia
- (b) Age
- (c) General condition.

(30) Success or failure of any form of treatment of empyema in children depends upon the age. Younger the child, worse the prognosis.

(31) In infants empyema is especially fatal; in older children and young adults mortality falls, rising again in older people.

(32) Chief causes of chronic empyema:
- (1) Delayed diagnosis
- (2) Inadequate treatment
- (3) Nature of infection.

(33) Rigidity and thickness of the walls of an empyema cavity vary directly with its chronicity and ultimately may be the cause of its persistence.

(34) One of the principal complications of chronic empyema is pus or air embolism.

(35) All operation for chronic empyema must be multi-staged:
- (1) Thorough exploration
  - ↓ Removal of offending cause
  - ↓ Drainage: (a) Simple open
    (b) With irrigations
- ↓ (2) Closure of the cavity:
  - (A) Operations on the lung:
    - (a) Decortication
    - (b) Discission

(B) Operations on thoracic wall: Thoracoplasty

(1) Total : { (α) Brauer
(β) Sauerbruch
(γ) Wilms.

(2) Partial: { (α) Estlander
(β) Schede.

(36) Indication for plastic chest operations for chronic empyema:

: Arrest in the progress of diminution of empyema cavity.

(37) If there is a persistent sinus in chronic empyema:

(*a*) Examine the discharge: ? Tuberculosis

(*b*) Squirt in methylene blue and examine the expectoration: ? Pleuro-bronchial fistula.

(38) Any form of open drainage of an uninfected tuberculous empyema is the worst possible treatment. Either aspirate or institute closed intercostal drainage.

(39) Gauvain's fluid:

Guiacol	gms.	II
Iodoform	gms.	V
Ether	gms.	X
Sterile olive oil	c.cs.	100.

CHAPTER IV

THE MEDIASTINUM AND THE CHEST

(I) MEDIASTINUM

(1) MEDIASTINITIS:
  Def: Cellulitis of the mediastinal cellular tissues
  (A) ACUTE MEDIASTINITIS:
    Etio: (1) Post-operative
          (2) Post-septic:
      Causes: (A) Cervical: (a) Cellulitis
                             (b) Thyroiditis
                             (c) Œsophagitis
                             (d) Retropharyngitis
              (B) Chest: (a) Broncho-pneumonia
                         (b) Empyema
                         (c) Pericarditis
                         (d) Œsophagitis
              (C) Mediastinal lymphadenitis
    Sites: (A) Anterior mediastinitis
           (B) Posterior mediastinitis
    Clinic: (1) Acute general toxaemia
            (2) Intrathoracic pressure:
                (a) Vessels. œdema and visible veins
                (b) Nerves: pain
                (c) Trachea: dyspnoea
                (d) Œsophagus: dysphagia
            (3) Pointing abscess:
                (a) Suprasternal notch
                (b) Posterior triangle neck
                (c) Intercostal space
                (d) Viscera
            (4) X-Ray
    Compl: (1) General toxæmia
           (2) Pressure complications
           (3) Rupture complications
    Treat: (1) General antiseptic: sulphonamide
           (2) Treat the primary focus
           (3) Drainage: if abscess
  (B) CHRONIC INDURATIVE SYPHILITIC MEDIASTINITIS:
    Etio: Syphilis
    Path: (1) Diffuse indurative
          (2) Local gumma
    Clinic: (a) Slowly progressive pressure signs
            (b) Presence of syphilitic stigmata
            (c) Reaction to treatment
    Treat: Antisyphilitic

(C) T. B. MEDIASTINAL LYMPHADENITIS:

Etio: (1) **Primary**: (*a*) Cervical gland tuberculosis
↓ (*b*) Mediastinal extension
(2) **Secondary**: To phthisis

Path: (1) T. B. gland
↓ (2) *Perilymphadenitis → matting*
↓ (3) **Calcification**
or (4) Caseation
↓ (5) **Cold abscess**
↓ (6) **T. B, sinus**: Sternal or inter-costal
or (7) Rupture into pleura: tuberculous empyema

Clinic: (1) **X-Ray**: Calcification
or (2) **Parasternal cold abscess or sinus**
or (3) **Pressure syndrome**:
: Hyperplastic tuberculosis

Diff. diag: (1) Mediastinal tumours
(2) **T. B. bone**
(3) Other causes of glandular enlargement:
(*a*) Hodgkin
(*b*) Malignancy

(2) MEDIASTINAL CYSTS:

Class: (A) Dermoid cysts: Epidermal
Source: (*a*) *Inclusion*
(*b*) Cervical sinus
(B) Teratomatous cysts: (*a*) Mesodermal
(*b*) Entodermal
Source: Primitive germ cells
(C) Tracheo bronchial cyst:
Source Tracheo-bronchial tube

Clinic: (1) Pressure symptoms:
(*a*) Dyspnœa, cough and pain
(*b*) Prominent veins, œdema
(2) X rays

Compl. (1) Pressure:
(*a*) Vessels: prominent veins, œdema
(*b*) Respiratory tract: dyspnœa, cyanosis
(*c*) Œsophagus: dysphagia
(2) Infection: mediastinitis and abscess
(3) Perforation:
(*a*) External: sinus formation
(*b*) Internal: into neighbouring organs
(4) Malignancy

Treat: Excision

(3) TUMOURS OF THE MEDIASTINUM:

(A) Lipoma
(B) Fibroma

(c) Chondroma: Sternum, rib, spine

(d) Ganglioneuroma:

Age: Children

Site: Sympathetic cord

(e) Hourglass neuro-fibroma.

Path: (1) Compression of the cord

(2) Intrathoracic pressure

Clinic: (1) Spinal signs: (a) Root pains

(b) Paralysis

± (2) Intrathoracic pressure signs

(F) Lymph gland tumours:

(a) Hodgkin

(b) Lympho-sarcoma

(c) Secondary carcinoma

Primaries in: (α) Breast

(β) Œsophagus

(γ) Bronchus and lung

(G) Intrathoracic goitre:

Path: Cystic colloid adenoma

Clinic: (1) Retrosternal dullness

(2) Pressure syndrome:

(a) Trachea: cough, dyspnœa, stridor

(b) *Vessels: enlarged veins, œdema, cyanosis*

(c) Nerves: recurrent laryngeal paralysis

(d) Œsophagus: dysphagia (rare)

(H) Thymus:

(1) Enlarged thymus:

Causes: (a) Status thymo-lymphaticus

(b) Rickets

(c) Toxic goitre

(d) Leukæmia

(e) Addison's disease

(f) Myasthenia gravis

(2) Cysts: Hygroma

(3) Tumours: (a) Malignant thymoma:

(α) Lymphadenoma

(β) Lympho-sarcoma

(γ) Spindle-celled sarcoma

(b) Thymic carcinoma

(c) Perithelioma

Clinical features of mediastinal growths:

(1) Retrosternal dullness

(2) Pressure syndrome:

(a) **Trachea:** Dyspnœa, cough, stridor

(b) **Œsophagus:** Dysphagia

(c) **Vessels:** Prominent veins, œdema, cyanosis

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(3) Perforation:
(a) External: sinus formation
(b) Internal: into neighbouring organs
(4) Malignancy

Treat: Excision

(3) TUMOURS OF THE MEDIASTINUM:
(A) Lipoma
(B) Fibroma

(C) Chondroma: Sternum, rib, spine
(D) Ganglioneuroma:
Etio: Children
Site: Sympathetic cord
(E) Hourglass neuro-fibroma
Path: (1) Compression of the cord
(2) Intrathoracic pressure
Clinic: (1) Spinal signs: (a) Root pains
(b) Paralysis
+ (2) Intrathoracic pressure signs

(F) Lymph gland tumours:
(a) Hodgkin
(b) Lympho-sarcoma
(c) Secondary carcinoma
Primaries in: (α) Breast
(β) Œsophagus
(γ) Bronchus and lung

(G) Intrathoracic goitre:
Path: Cystic colloid adenoma
Clinic: (1) Retrosternal dullness
(2) Pressure syndrome:
(a) Trachea: cough, dyspnœa, stridor
(b) Vessels: enlarged veins, œdema, cyanosis
(c) Nerves: recurrent laryngeal paralysis
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(3) Tumours: (a) Malignant thymoma:
(α) Lymphadenoma
(β) Lympho-sarcoma
(γ) Spindle-celled sarcoma
(b) Thymic carcinoma
(c) Perithelioma

Clinical features of mediastinal growths:
(1) **Retrosternal dullness**
(2) **Pressure syndrome:**
(a) **Trachea:** Dyspnœa, cough, stridor
(b) **Œsophagus:** Dysphagia
(c) **Vessels:** Prominent veins, œdema, cyanosis

(*d*) **Lymphatics:** Chylothorax
: Chylous ascitis

(*e*) **Nerves:**
: *Recurrent laryngeal nerve; intercostal nerves*

Treat: (1) Surgical excision
(2) Radium
(3) **Deep X-Rays**

(4) MEDIASTINAL EMPHYSEMA:
Def: Presence of gas in the cellular tissues of the mediastinum
Cause: Communication with. (*a*) Air passages
(*b*) Outside atmosphere
(*c*) Pneumothorax
Due to: (*a*) Trauma
(*b*) Operations: tracheotomy
(*c*) Perforations: respiratory tract
: œsophagus
Clinic: (1) Pressure syndrome
(2) Crepitant feel
(3) Tympanitic resonance
Treat: Suprasternal incision and suction-aspiration

(II) INTRATHORACIC TUMOURS

Classification:

(A) **Benign:**
(*a*) Chest wall: (1) Chondroma } of a rib
(2 Osteoma } of a rib
(3) *Endothelioma of pleura*
(*b*) Mediastinum: (1) Dermoid cyst
(2) Lipoma
(3) Fibroma
(4) Ganglioneuroma
(5) Neurofibroma: hourglass
(6) *Thymoma*
(7) Restrosternal goitre
(*c*) Bronchi and lungs: (1) Bronchial fibroma
(2) Congenital cystic disease
(3) Hydatid cyst

(B) **Malignant:**
(1) **Primary:**
(*a*) Chest wall: (1) Sarcoma: chondro-sarcoma
(2) Endothelioma of pleura
(*b*) Mediastinum: (1) Teratoma
(2) Lympho-sarcoma
(3) Lymphadenoma
(*c*) Bronchi and lung: (*1*) *Carcinoma:*
(α) Central
(β) Peripheral
(2) Sarcoma

Types: (1) Local
(2) Local: with neighbouring changes
(a) Collapse lung
(b) Bronchiectasis
(3) Scattered: pleural endothelioma

(2) **Secondary:**
(a) Chest wall:
Primary: breast
Clinic: (1) Nodular form
(2) Miliary carcinosis
(3) Infiltrative type

(b) Mediastinum:
Primaries: (1) Breast
(2) Œsophagus
(3) Thyroid
(4) Bronchi and lungs
Path: (1) Secondary glands
(2) Malignant infiltration

(c) Lungs:
Primaries: (1) Sarcoma
(2) Malignant melanoma
(3) Carcinoma

Diagnostic methods in intrathoracic tumours;

(1) **X-Rays:** (a) Plain
(b) Lipoidol
(c) After pneumothorax

(2) **Sputum** examination
(3) **Pleural aspiration**
(4) **Bronchoscopy**

Compl: Pressure syndrome
Treat: (A) Innocent: removal
(B) Malignant: (a) Early removal
(b) Radiotherapy

(III) OPERATIONS ON THORAX

Methods for preventing collapse of the lung during operation:

(1) Mechanical fixation of the lung:
: By **adhesions between lung & pleura:**
(a) Natural: in sepsis
(b) Stitching parietal pleura to the lung

(2) **Grasp and traction on the lung** towards the wound:
(a) Manual
(b) Instrumental

(3) Compression of the chest and abdomen:
: With **guarding of the thoracic wound**

(4) **Intratracheal insufflation under pressure**

(1) OPERATIONS FOR INJURIES TO THE CHEST:

(A) **Traumatic hæmothorax:**

(1) Recent and small: leave alone
(2) Recent and large:
: **Aspiration** with oxygen replacement
(3) Massive or recurrent: (*a*) **Thoracotomy**
↓ (*b*) Evacuation
↓ (*c*) Closure

(B) **Penetrating wounds of the chest:**

Ind: Every penetrating wound of the chest below the level of the fifth rib should be explored, as it may involve *diaphragm and upper abdominal viscera.*

Tech: (1) Thoracotomy:
: Excision of 5" of any of the fifth to eighth ribs
↓ (2) Thoracic exploration and treatment
↓ (3) Suture of the diaphragmatic rent
↓ (4) Abdominal extension of the wound
↓ (5) Abdominal exploration and treatment

(C) **Gunshot wounds of the chest:**

Ind: (1) Hæmorrhage: (*a*) External
(*b*) Internal
(2) Large hæmothorax
(3) Large pneumothorax
(4) Abdomino-thoracic wound
(5) Compound fracture of ribs

Contraind: (1) Collapse and shock
(2) Collapse of opposite lung

Tech: (1) Excision of parietal wound
(2) Thoracotomy: rib resection
(3) Exploration:
(*a*) Respiratory viscera
(*b*) Circulatory viscera
(*c*) Diaphragm
(*d*) Abdominal viscera
(*e*) Parietes
(4) Treatment of foci: (*a*) Removal of F. B.s
(*b*) Suture of rents
(*c*) Evacuation of clots
(5) Suture and closure

(2) PARACENTESIS THORACIS:

(A) **Simple paracentesis:**

Ind: (1) Diagnosis } **of pleural effusions**
(2) Treatment }

With: (*a*) **Doubtful diagnosis**
- (*b*) **Pressure syndrome:**
  - (α) Orthopnœa or dyspnœa
  - (β) Cardiac irregularity
- (*c*) **General toxæmia**
- (*d*) Massive effusions
- (*e*) Empyema

Site: (*a*) **Most dependant spot:**
- (α) Clinical: centre of maximum dullness
- (β) X-rays
- (*b*) 6th inter-space in post. axillary line
- (*c*) 8th or 9th inter-space in scapular line

Tech: (1) Keep stimulants ready
- (2) **Local anæsthesia:** 1% novocain
- (3) Avoid: (*a*) A rib
  - (*b*) Entry of air in pleural cavity
  - (*c*) Injury to the lung
  - (*d*) Angular movements of the needle
- (4) Create vacuum in the syringe after piercing the subcutaneous tissues but before entering the pleural cavity
- (5) **Fluid not to be evacuated:**
  - (*a*) **Rapidly**
  - (*b*) Completely
- (6) Preserve the fluid for laboratory examination
- (7) Withdraw the needle rapidly
- (8) Seal the puncture of entry
- (9) **Observe the patient's condition throughout**

Compl: (1) Pleural syncope
- (2) **Shock**
- (3) Hæmorrhage
- (4) **Injury to viscera:** Lung, heart
- (5) Embolism
- (6) Œdema of the lung
- (7) Cough

(B) **Paracentesis with oxygen replacement:**

Ind: **Massive pleural effusions:**

With: (*a*) Mobile mediastinum
- (*b*) Marked pressure syndrome
- (*c*) Irritative signs
- (*d*) Maintenance of lung collapse advisable

Tech: (1) Aspiration needle: as in (A)
- \+ (2) Pneumothorax needle: well above
  - (*a*) Aspirate from below
  - \+ (*b*) Introduce oxygen 200 c.cs. from above:
    - : When cough or distress appears

(B) EXTENSIVE THORACOPLASTY:

Ind: (1) Unilateral pulmonary **tuberculosis:**
: With failure of pneumothorax
(2) **Empyema**
(3) **Bronchiectasis**

Contraind: (A) General condition:
(a). Extreme age
(b) General debility
(c) Circulatory or renal inefficiency
(B) Lung condition:
(a) Bilateral exudative phthisis
(b) Diseased contralateral lung:
(α) Broncho-pneumonia
(β) Bronchiectasis
(γ) Empyema
(C) Tuberculosis elsewhere:
(a) Laryngeal
(b) Abdominal
(c) Renal

Techniques: (1) Brauer Total decostalisation
: Removal of entire lengths of 2nd to 11th ribs
(2) Wilms: Bilateral mobilisation
(a) First stage: Paravertebral or posterior
Excision of 2 cms. to 8 cms. of paravertebral portions of 1st to 11th ribs through an incision at the outer border of erector spinæ from 6 C. to 11 D.
(b) Second stage: Costosternal or anterior
: Excision of costal cartilages 1st to 7th, through an incision along the sternal border
(3) **Sauerbruch:**
: Paravertebral rib mobilisation

Def: Two-stage paravertebral extra-pleural subperiosteal resection of 3 to 11 cms. of paravertebral portions of 1st to 11th ribs

Anæsth. Local with general

Position: Lying on the sound side
\+ Raised head and shoulders
\+ Arms held up and forwards

Tech: (a) Incisions:
(α) Upper: 6th cervical vertebra
↓ Paravertebral
↓ Inferior scapular angle
↓ Mid-axillary line
(β) Lower: Spine of the scapula
↓ Paravertebral
↓ 11th rib

(b) Division of extracostal muscles
(c) Retraction of scapula
(d) Novocainisation of intercostal nerves
(e) Stripping of periosteum
(f) Paravertebral excision of ribs:
  (α) 2" of first
  (β) 4" of second and eleventh
  (γ) 6" of all others
(g) Closure with 72 hours drain
(h) Firm strapping

(4) Maurer: Modified Sauerbruch
: Paravertebral mobilisation of ribs by excision of transverse processes of vertebræ

Operative difficulties of thoracoplasty:

(1) Injury to intercostal artery
(2) Injury to parietal pleura

Post-operative treatment of thoracoplasty:

(1) Elastic strapping with firm binder → belt
(2) Sling to the upper extremity
(3) Drainage
(4) Stimulant expectorants

Post-operative complications of thoracoplasty:

(1) Shock and collapse
(2) Cardiac failure
(3) Reaction
(4) Exacerbation of underlying disease
(5) Suppuration
(6) Lung complications:
  (a) Tuberculosis: (α) Exacerbation in same lung
    (β) **Aspiration in other lung**
  (b) Inflammatory: (α) Bronchitis
    (β) Broncho-pneumonia
    (γ) Aspiration pneumonia
  (c) **Atelectasis**
(7) *Cardiac displacement*
(8) Mobile displaced mediastinum
(9) **Deformity:** Scoliosis
(10) Paralysis of abdominal muscles

(6) EXTRAPLEURAL PNEUMOLYSIS:

Def: *Localised compression of the lung* by stripping parietal pleura off the chest wall over a diseased area and packing some substance in the extrapleural cavity.

Ind: (See under Lung)

Anæsth: Local infiltration

Tech: (A) Anterior approach:

(a) Transverse subclavicular incision
(b) Sub-periosteal excision of anterior end of 2nd or 3rd rib
(c) Incision of posterior periosteum
(d) Stripping off of the parietal pleura by gloved finger
(e) Introduction into the cavity thus made, of:
(α) Paraffin wax. at 45°-50°C.
: (Sterilised by heating for one hour at 150°C.)
(β) Muscle graft
(γ) Fat graft

(B) Posterior approach:
(a) Paravertebral incision
(b) Exposure and excision of the third rib between scapular border and spinous process
(c)
(d) } Same as in (A)
(e)

Post. compl: (1) Trauma to the lung
(2) Rupture of a tuberculous cavity:
: Abandon the operation
(3) Pressure ulceration
(4) Infection → sinuses

(7) INTRA-PLEURAL PNEUMOLYSIS: Thoracolysis

Def: Division of pleural adhesions complicating pneumothorax

Tech: (1) Closed: Jacobœus:
(a) Insertion of a thoracoscope through a cannula introduced into the pleural cavity through a neighbouring interspace
↓ (b) Introduction of an electric cautery through another interspace
↓ (c) Cautery division of pleural adhesions under thoracoscopic guidance

(2) Open:
(a) Local anæsthesia
(b) Incision:
(α) Anterior: resection of 1.5" of 2nd rib
(β) Posterior: resection of 2" of 4th or 5th rib
(c) Division of pleura round the adhesion:
: By knife or cautery

Compl: (1) Effusion: (a) Serous
(b) Hæmorrhagic
(c) Purulent
(2) Pleuro-bronchial fistula

(8) BRONCHOTOMY:

Tech: Reflection of an osteoplastic flap of dorsal ends of 5th, 6th, 7th and 8th ribs

(9) BRONCHO-CUTANEOUS FISTULÆ:

(A) Conservative: (a) Paint with 35% silver nitrate
(b) Paint with 95% alcohol
(c) Cauterisation

(B) Operative: (*a*) Isolation and excision of the tract
↓ (*b*) Pack the cavity with pedunculated muscle-graft

(10) PNEUMOTOMY:

Ind: (1) Exploration of lung for **trauma**: one stage
(2) Drainage of lung **abscess**: two stage
(3) **Lobectomy**

Principles: (1) Exact preoperative localisation: (*a*) Clinical
(*b*) X-ray
(2) Two stage operation:
(*a*) Adhesions between the pleuræ
↓ (*b*) Removal of the parietal wall of abscess

Tech: (A) **First stage:**

Position: Semi-sitting
Anæsth: Local infiltration
Site: Dependant over the abscess
Steps: (*a*) Resection of 3" of two ribs:
: With inter-costal tissues
(*b*) Pack of iodine gauze over the parietal pleura
(*c*) Temporary closure

(B) **Second stage:**

(*a*) Open out the wound
(*b*) Exploration by syringe
(*c*) Protection of the surroundings
(*d*) Excision of the lung tissue forming the parietal wall of the abscess
(*e*) Large drainage tube

Post. compl: (1) Shock
(2) Hæmorrhage
(3) [illegible]
(4) [illegible]
(5) [illegible]
(6) Empyema
(7) Infection of the chest wall
(8) Broncho-cutaneous fistula

(11) LOBECTOMY:

Ind: (1) Unilateral **bronchiectasis**
(2) Local bronchial **carcinoma**:
: (Pneumonectomy is more radical)
(3) Chronic lung **abscess**

Tech: (A) **One stage:**

Ind: Pleural adhesions already present
Anæsth: Positive pressure intratracheal
Position: Lying on the sound side
Steps: (1) Major inter-costal thoracotomy:
: 7th space

(2) Crush the phrenic: (lower lobe)
(3) Division of: (a) Pleural adhesions
(b) Pulmonary ligament
(4) Separation along inter-lobar fissure
(5) Two tourniquets around the pedicle
(6) Pleural pack
(7) Division of pedicle
(8) Closure of pedicle:
: Three rows of No. 1 chromicised catgut on round needle
(9) Burying the pedicle
(10) Test for leakage
(11) Drainage:
: Resection of 9th rib in mid-axillary line

(B) **Multi-staged:**
Ind: Pleural adhesions absent
Tech: (1) After **plombage**
(2) After pleural adhesions by **gauze packs**
(3) Cautery pneumonectomy · Graham
(a) Posterior thoracotomy
+ Pleural packing or suture
↓ (b) Cauterisation of the lobe in recurrent sittings
(4) Deliverance lobectomy: Whittemore
(5) Pedicle dissection lobectomy: Rienhoff
(a) First stage
(α) Isolation and ligature of pulm. art.
+ (β) Ligature of main bronchus
(b) Second stage: after 10 days
: Pneumonectomy

(IV) OPERATIONS ON MEDIASTINUM

(1) POSTERIOR EXTRA-PLEURAL APPROACH:
Ind: (1) Mediastinal abscess
(2) Mediastinal tumour
(3) Exposure of œsophagus
Tech: (1) Incision: Vertical 1" lateral to vertebral spines
(2) Division of extracostal muscles
(3) Excision of: (a) 3" of posterior ends of 4 ribs
(b) Tips of transverse processes
(4) Ligation and division of intercostal bundles medially and of posterior periosteum above and below
(5) Stripping of parietal pleura

(2) ANTERIOR APPROACH:
(A) Anterior intercostal approach Transpleural
Ind: Excision of dermoid

Tech: (1) Incision: (a) Mid-axillary to mid-sternum along a rib
↓ *Resection of the rib*
or (b) Osteoplastic flap of 2nd to 4th rib
(2) Opening of pleural cavity
(3) Spreading of the ribs after resection of costal cartilages

(B) Milton's sternum-splitting approach: Extrapleural
Ind: Retrosternal goitre
Tech: (1) Incision: (a) Cervical collar
+ (b) Vertical midline
(2) Exposure of the sternum
(3) Midline drilling: opposite 3rd interspace
or (4) Introduction of bone shear from upper side
(5) Transverse → vertical splitting and retraction
(6) Treatment of focus
(7) Closure by wiring

(C) Cervical approach:
Ind: (1) Retrosternal goitre: urgent decompression
(2) Surgical emphysema
Tech: Incision: transverse supra-sternal

(V) IMPORTANT POINTS

(A) Trauma:

(1) Indications for operation for thoracic trauma:
(1) Hæmorrhage: external
(2) Hæmothorax: massive or recurrent
(3) Penetrating wound below 5th rib: ? visceral injury
(4) Gunshot wounds.

(2) Strapping for fracture rib must start and end beyond the midline of the body and must be applied in full expiration.

(B) Empyema:

(3) Aspiration treatment in acute empyema:
(1) Diagnosis
(2) Children
(3) Thin exudate
(4) Bad toxæmia
(5) Synpneumonic
(6) Early stages
(7) Massive effusion with pressure
(8) Mobile mediastinum
(9) Bilateral

(4) Advantages of closed suction drain:
(1) Re-expansion of lung
(2) Good drainage
(3) Prevention of secondary infection.

(5) Treatment of empyema in a nutshell:
  (1) Aspiration
  (2) Intercostal drainage
  (3) Costal drainage.

(6) Methods of drainage in empyema:
  (1) Closed : (*a*) Simple
                (*b*) Suction
  (2) Open.

(7) Most common cause of acute empyema: pneumonia.

(8) Most common cause of insidious empyema: tuberculosis.

(9) Chronic empyema:
  (1) Failure of thoracotomy for acute empyema to heal within 2 months
  (2) Empyema necessitatis
  (3) General cachexia with respiratory *trouble.*

(10) Treatment of chronic empyema:
  (1) *Simple free drainage*
  ↓ (2) Dakin's pleural wash-outs
  ↓ (3) Decortication
  ↓ (4) Thoracoplasty.

(C) Lung suppuration:

(11) Treatment of lung suppuration:
  (1) Expectorants and antiseptic inhalations
  (2) Postural drainage
  (3) Bronchoscopic drainage
  (4) Pneumothorax
  (5) Phrenic avulsion
  (6) Thoracoplasty
  (7) Pneumotomy and drainage
  (8) *Lobectomy.*

(12) Lung abscess is most common after operations on oral and pharyngeal cavities: (Tonsillectomy).

(13) Treatment of bronchiectasis:
  (1) *Early stage: medical*; **postural**; *bronchoscopic*
  (2) Unilateral:
    : Multistaged paravertebral extrapleural **thoracoplasty**
  (3) Advanced stage: **Lobectomy.**

(D) Atelectasis and embolism:

(14) Prevent collapse of the lung during operation by:
  (1) Guarding the thoracotomy wound
  (2) Traction on lung
  (3) Positive pressure anæsthesia.

(15) Measures for lung expansion:
  (1) CO_2 inhalations

(2) Deep breathing exercises
(3) Suction drain.

(16) Clinical aspects of pulmonary embolism:
(1) Immediate death
(2) Acute cardiac and lung crisis → death
(3) Pneumonia (infarction).

(E) **Phthisis:**

(17) Chronic fibroid or productive phthisis is good for surgery:
(*a*) **Artificial pneumothorax**
(*b*) **Phrenic avulsion**
(*c*) **Pneumolysis:** (α) Intrapleural
(β) Extrapleural
(*d*) **Thoracoplasty:** (α) Sauerbruch
(β) Wilms
(γ) Brauer.

(18) Contraindications for operative treatment in phthisis:
(1) Active progressive disease in opposite lung
(2) Do not operate if trachea is in midline.

(F) **Tumours:**

(19) Common intrathoracic tumours which are operable:
(1) Retrosternal goitre
(2) Mediastinal dermoid
(3) Primary carcinoma
(4) Hydatid cyst.

(20) Diagnostic methods in intrathoracic tumours:
(1) Clinical examination: (*a*) Pressure syndrome
(*b*) Consolidation signs
(2) X-Rays:
(*a*) Plain
(*b*) Lipoidol
(*c*) After lung collapse: by pneumothorax
(3) Sputum examination
(4) Pleural fluid
(5) Bronchoscopy.

(21) Mediastinal tumours cause symptoms early due to pressure; tumours of lung and pleura are comparatively silent.

(22) The most common intrathoracic neoplasm is secondary carcinoma: (*a*) Lymph glands
(*b*) Lungs
(*c*) Pleuræ.

(23) Do not forget to examine all bones for secondaries in bronchial carcinoma.

(24) Secondary carcinoma in lung contraindicates surgery.

(25) Secondaries in lung:
- (a) Single: 'Cannon-ball'
- (b) Multiple small
- (c) Scattered infiltration

(26) Respiratory symptoms in cancer people:
? Lung secondaries.

(G) General:

(27) Dyspnœa with cyanosis:
- (1) Consolidation of lung: (a) Pneumonia
  - (b) Atelectasis
- (2) Pleural effusion: (a) Serous
  - (b) Blood
  - (c) Pus
  - (d) Chyle
  - (e) Air
- (3) Cardiac incompetency.

(28) Common post-operative pulmonary complications:
- (1) **Bronchitis with basal congestion**
- (2) **Pneumonia:** (a) Pre-operative
  - (b) Exposure
  - (c) **Anæsthetic**
  - (d) **Aspiration**
  - (e) Hypostatic
  - (f) Septicæmic.
- (3) Acute œdema of the lungs
- (4) **Massive pulmonary collapse**
- (5) Pulmonary embolism.

(29) Mediastinal pressure syndrome:
- (1) Aneurysm
- (2) Retrosternal goitre
- (3) Lymph glands: (a) Malignant
  - (b) Hodgkin
  - (c) Tuberculous.

(30) Cold abscess on the sternum:
- (1) Tuberculosis: (a) Periosteum
  - (b) Sternum
  - (c) Rib
  - (d) Mediastinal lymph gland
- (2) Breaking down periosteal gumma.

(31) Complications of open pneumothorax:
- (1) Flapping mediastinum
- (2) Collapse lung.

(H) Miscellaneous:

(32) Dakin's solution causes chemical decortication

(33) Lymphocytes are most sensitive to radiotherapy:

(a) Lymphadenoma
(b) Lymphatic leukæmia
(c) Lympho-sarcoma.

(I) Operations:

(34) Major intercostal thoracotomy:
: Whole of 4th, 5th or 6th interspace with posterior mobilisation of upper and lower one or two ribs.

(35) Phrenicotomy:
Tech: (a) Radical phrenicotomy of Goertze
(b) Phrenicus exairesis of Felix
(c) Simple crushing.
Ind: (1) Independent: basal or diaphragmatic lesions
(2) Adjunct or preliminary to: (a) Pneumothorax
(b) Thoracoplasty

(36) Common sites for paracentesis thoracis:
(1) Centre of maximum dullness
(2) X-Ray
(3) 6th interspace in posterior axillary line
(4) 8th or 9th interspace in scapular line.

(37) Chief indications for thoracoplasty:
(a) Chronic empyema
(b) Unilateral phthisis
(c) Unilateral bronchiectasis
} Failure of conservative treatment for four months.
+ (d) Other lung practically healthy.

(38) Thoracoplasty:
(A) Regional decostalisation: (a) Estlander
(b) Schede
(c) Roberts.
(B) Extensive or total:
(a) Brauer: total
(b) Wilms: both ends
(c) Sauerbruch: paravertebral
(d) Maurer: transverse processes.

(39) Forms of paravertebral thoracoplasty of sauerbruch:
(A) Total paravertebral: 1st to 11th rib
(a) Single stage
(b) Two stage
(B) Partial paravertebral:
(a) Sub-total paravertebral: 1st to 8th rib
(b) Upper lobe: 1st to 6th rib
(c) Apical: whole of 1st and 2nd rib.

(40) Most important part of thoracoplasty is wedge excision of the first rib, as close to the transverse process as possible, without injury to subclavian vessels and brachial plexus.

(41) Injection of intercostal nerves with novocain is recommended in every extensive thoracic operation to minimise the shock.

(42) For extensive removal of the ribs, cut them in the middle and remove anterior and posterior portions separately by fracturing them at the costal cartilages and rib angles respectively.

(43) *The most frequent post-operative complication after thoracoplasty* is atelectasis, which depends upon the retention of bronchial secretion due to the reduced expectorative ability of the affected side.

(44) Some points in thoracoplasty:
- (*a*) Avoid too extensive resection of ribs
- (*b*) Avoid preliminary phrenicotomy
- (*c*) Be careful of mobile mediastinum
- (*d*) Choose the right time.

(45) Chief problems of lobectomy:
- (1) Infection of pleural cavity
- (2) Leakage from the stump
- (3) Mediastinal infection and emphysema.

(46) Role of pleural adhesions in lobectomy:
- (*a*) Pleural adhesions present: one stage
- (*b*) Pleural adhesions absent: two stage
  - (α) Pleural approximation
  - ↓ (β) Lobectomy.

CHAPTER V

SURGERY OF THE DIAPHRAGM

THE DIAPHRAGM

(I) CONGENITAL MALFORMATIONS:

(1) **Absence:**

(A) **Complete:** (*a*) **Bilateral**
(*b*) **Unilateral**

With: Intrathoracic prolapse of abdominal organs

(B) **Muscular element:**

With: Complete diaphragmatic hernia

(2) **Incomplete fusion:** (*a*) Anterior
(*b*) Posterior
(*c*) Central

(3) **Eventratio diaphragmatica:**
: (*a*) Fibrous degeneration of muscle
+ (*b*) Invagination into the thorax

(II) TRAUMA:

(1) **Rupture:**

Etio: (*a*) **Buffer** accidents
(*b*) Sudden rise in intra-abdominal pressure

(2) **Wounds:**

Etio: (*a*) **Stab** wounds: lower thorax
: upper abdomen
(*b*) **Gun shot** wounds

Clinic: (A) General: shock and hæmorrhage
(B) Local:
(1) Open: prolapse of abdominal viscera in the chest wound
(2) Closed: tension pneumothorax

Compl: (1) Hæmorrhage
(2) **Associated visceral injury:**
: (*a*) Spleen and liver
(*b*) Alimentary canal
(3) Infection: (*a*) Thoracic: empyema
(*b*) Abdominal: peritonitis

Treat: Exploration:

(A) **Thoracic:**

Ind: (*a*) Trauma via thorax
(*b*) Associated trauma to thoracic viscera

(B) **Marwedel**

(C) **Abdominal:**

Ind: (*a*) Trauma via abdomen
(*b*) Associated trauma to abdominal viscera

(III) DIAPHRAGMATIC HERNIA:

Def: A breach in the continuity of diaphragm followed by *invasion of the thorax by abdominal viscera*

Etio: Age: (*a*) Children
(*b*) *Over 50*

Sex: Females

Factors: (*a*) **Congenital** under-development
(*b*) ***Trauma*** *and its sequelæ*
(*c*) **Paralysis:** phrenic interruption
\+ (*d*) Intermittent high abdominal pressure:
(α) Adiposity
(β) Constipation
(γ) Pregnancies

Path. class: (A) **Eppinger's classification:**

(1) **Hernia vera:**
(*a*) **Congenita**
(*b*) **Traumatica**
(*c*) **Foraminalis or hiatus:**
(α) Parasternalis: sterno-costal
(β) Bochdaleki: lumbo-costal
(γ) **Para-œsophageal**
(δ) Nervi sympathetici
(*d*) **Para-œsophageal:**
Types: (α) Short œsophagus type: congenital
(β) Para-œsophageal type: acquired
(γ) **Gastro-œsophageal type;** acquired

(2) **Hernia spuria:**
(*a*) *Congenita*
(*b*) Traumatica

(3) **Eventratio diaphragmatica:**
(*a*) Diffusa
(*b*) Circumscripta

(B) **Hume's classification:**

(1) Domal
(2) **Para-œsophageal**
(3) Absence of half of the diaphragm
(4) Pleuro-peritoneal canal
(5) Vascular foraminal

Path: (1) Paralysis and atrophy of diaphragmatic musculature with paradoxical movements

(2) Presence of abdominal viscera in chest pressing on and displacing the thoracic organs.

Clinic: (A) **Symptoms:** (1) **Abdominal:**
- (*a*) Dysphagia
- (*b*) Dyspepsia

(2) **Thoracic:**
- (*a*) Respiratory
- (*b*) Cardiac

(3) **General:**
- (*a*) Neurasthenia
- (*b*) Anæmia.

(*a*) **Dyspepsia related to food and posture**

(*b*) **Paroxysmal cyanosis and cough**

(*c*) **Cardiac embarrassment**

(B) **Signs:** (1) Thoracic tympanitis
(2) Cardiac displacement
(3) X-Rays: (*a*) Erect
(*b*) Prone
(*c*) Trendelenburg

Diff. diag: (1) Œsophageal lesions
(2) Stomach lesions: ulcer or carcinoma
(3) Surgical dyspepsia: cholecystitis
(4) Respiratory lesions: (*a*) lung disease
(*b*) pneumothorax
(5) Cardiac lesions
(6) Diaphragmatic lesions. subdiaphragmatic abscess
(7) Acute abdomen: (in strangulation)

Compl.: (1) **Incarceration** }
↓ (2) **Strangulation** } :

Clinic: (*a*) **Acute intestinal obstruction**
+ (*b*) History of triple disturbances:
(α) Respiratory
+ (β) Cardiac
+ (γ) Digestive

Diff. diag: (1) Acute abdomen
(2) Acute respiratory disease

Treat: (1) Radical operation: pleuro-abdominal
(2) Short circuit → radical operation:
: In bad cases
(3) Palliative phrenicectomy

Treat: (1) Small hernia with no symptoms:
: Leave alone
(2) Moderate hernia with mild symptoms:
: (*a*) Regulation of diet
(*b*) Reduction of weight

(3) Marked symptoms with failure of conservatism:

(*a*) **Paralysis of diaphragm : Phrenicectomy**

Ind : (α) Preliminary : crushing

(β) Palliative : avulsion

(*b*) **Radical operation :**

Radical operation for diaphragmatic hernia :

(A) **Trans-pleural route :**

(1) Anæsthesia : positive pressure
(2) Incision . 8th or 9th interspace with resection of ribs
(3) Phrenic nerve crush
(4) Incision of diaphragm
(5) Reposition of viscera
(6) Repair of the defect : fascia lata graft
(7) Closure

(B) **Abdominal route :**

(1) Marwedel exposure
(2) Retraction of left lobe of the liver
(3) Division of left suspensory ligament
(4) Incision of diaphragm
(5) Reposition of viscera
(6) Repair of the defect
(7) Closure

Post. compl: (1) Respiratory : Collapse lung
: Œdema lung
: Pneumonia
(2) Acute dilatation of the stomach
(3) Paralytic ileus

(IV) HICCOUGH :

Def : Involuntary spasmodic contraction of the diaphragm

Anat : (1) Afferent : vagus, sympathetic
(2) Centre . spinal segment : 3, 4, 5C.
(3) Efferent : phrenic

Etio : (1) **Functional :** Hysteria
(2) Central . encephalitis
(3) **Reflex :** Diaphragmatic irritation :

(*a*) **Œsophageal** lesions

(*b*) **Thoracic** lesions :

(1) Bronchial or mediastinal adenopathy
(2) Adherent or enlarged pericardium
(3) Fibrous mediastinitis
(4) Basal pleurisy

(*c*) **Abdominal** lesions :

(1) Gastric and duodenal
(2) Liver and biliary passages

(3) Sub-diaphragmatic abscess
(4) Spleen
(5) Pancreas
(6) Colon
(7) Paravertebral adenopathy
(8) Upper peritonitis
(9) Ileus

(4) **Toxic:** (*a*) **Uræmia**
(*b*) **Peritonitic toxæmia**
(*c*) Epidemic

(5) **Post-operative:**
(A) Operations on lower thorax
(B) **Operations on upper abdomen**
(C) Operations on toxæmic patients:
(*a*) **Peritonitis**
(*b*) **Uræmia**

Most common operations followed by hiccough:

(1) Stomach and duodenum
(2) Biliary apparatus
(3) Spleen
(4) Pancreas
(5) Colon
(6) Urinary organs : kidney
: bladder
: prostate

Compl: Exhaustion

Treat: (A) Treat the etiology
(B) Treat the hiccough:
(1) Mental: Distraction
(2) Position: Fowler
(3) Sedative: Bromides → Morphia
(4) Respiratory: Holding the breath
: **Co_2 inhalations**
: Nitroglycerine
(5) Digestive: Carminatives
: Stomach sedatives
: Stomach wash
(6) Reflex: Epigastric counter-irritation
: Ether 1 c.c. intramuscular
(7) Phrenicotomy: (α) Alcohol injection
(β) Crush

Special drugs for hiccough ;

(1) Saturated sol. of menthol in rect. spirit:
: 10 min. every hour

(2) 1 in 1000 adrenaline:
: 10 min. in teaspoonful water every hour

(3) Benzyl benzoate 20% in alcohol:
: 20 min. in water or milk

(V) IMPORTANT POINTS

(1) Stab wound below the 5th interspace with painful breathing:
: Wound of the diaphragm: explore.

(2) In every case of stab wound of the diaphragm, explore its neighbours, especially on the abdominal side.

(3) Etiology of diaphragmatic hernia:
(*a*) Congenital
(*b*) Trauma and its sequelæ
(*c*) Paralysis.

(4) Diaphragmatic hernia is a 'masquerader of the upper abdomen' as it closely simulates upper abdominal lesions.

(5) Paroxysmal cyanosis and cough are an invariable accompaniment of congenital diaphragmatic hernia.

(6) Diaphragmatic hernia has triad symptom-complex:
: Respiratory + Cardiac + Digestive.

(7) Crushing of the phrenic nerve is a very useful adjunct for operations on diaphragm.

CHAPTER VI

SURGERY OF THE HEART AND THE PERICARDIUM

THE HEART

(I) CONGENITAL AFFECTIONS:
: Patent ductus arteriosus:
Etio: Average age 24 years
Path: Communication between right and left auricles
↓ Arterio-venous communication
Compl: (a) Cardiac decompensation
(b) Bacterial endocarditis
Treat: (a) Conservative
(b) Exposure and ligature

(II) TRAUMA:
Varieties: (1) **Stab** wounds
(2) **Gun shot** wounds
(3) Travelling needles
Sites: **Left ventricle** → right ventricle → auricle
Clinic: (1) **External wound:**
: With external hæmorrhage
: Near the sternal edge
: Between 2nd and 6th costal cartilages
↓ (2) Free interval: **Latent period**
↓ (3) **Heart tamponade:**
(a) Shock
(b) Internal hæmorrhage signs
(c) Prominent veins
(d) Muffled cardiac sounds
(e) Increased heart area
↓ (4) Progressive **fall in blood pressure**
(5) X-Rays: (a) Increased heart area
(b) Stationary or weak heart
Compl: (A) **Immediate:** (1) **Shock**
(2) **Hæmorrhage:**
(a) External
(b) Internal
(3) Heart **tamponade**
(B) Late: (1) Pericarditis → pyopericardium
(2) Pleurisy → empyema
(3) Pneumonitis
(4) Sub-phrenic abscess
(5) Peritonitis

Treat : (1) No tamponade or hæmothorax :
: Conservative expectant treatment

(2) Tamponade responding to conservatism :
: Aspiration

(3) Tamponade not responding to conservatism :
: Operation

(4) Penetrating wound with : (a) Ext. hæmorrhage
(b) Tamponade
(c) Hæmothorax

: ? Operate

(III) CORONARY CARDIOPATHIES ·

Varieties : (A) Coronary thrombosis

(B) Congestive heart failure

(C) Angina pectoris

Etio : **Surgical operations :**

Factors . (a) Shock
(b) Dehydration
(c) Infection
(d) Tachycardia

Path : (A) **Transient or partial occlusion due to spasm :**
: Angina pectoris

(B) **Complete permanent occlusion of :**

(a) **Main coronary artery :**
. Cardiac failure

(b) **Branch** of coronary artery :
. (α) Cardiac failure
(β) Ischæmic infarction
(γ) Disturbed cardiac rhythm

Progress : (1) Spasmodic coronary occlusion : angina
↓ (2) Partial organic sclerosis : coronary arteritis
↓ (3) Total coronary occlusion : coronary thrombosis

: The fate of the heart muscle depends on :
(a) Degree of occlusion
(b) Size of occluded vessel
(c) Efficiency of collateral circulation

Heart in coronary disturbances :

(1) Disturbances of rhythm or rate
(2) Claudication : **angina pectoris**
(3) Cardiac infarcts
(4) Cardiac aneurysm
(5) [illegible]
(6) [illegible]
(7) [illegible]

Clinic: (1) Shock
(2) Respiratory crisis: dyspnœa, cyanosis
(3) Cardiac crisis: tachycardia, irregular heart
(4) Angina pectoris

Diff. diag: (1) Acute respiratory conditions
(2) Acute abdominal conditions
(3) Other causes of shock and collapse.

Treat: (A) **Angina pectoris and cardiac pains:**
Ind: Successful paravertebral novocain block
Tech: (1) **Paravertebral alcohol injections:**
: Upper five thoracic ganglia and their rami
(2) **Stellatectomy:** Left or both
(3) **Resection of upper thoracic ganglia**

Post. compl: (*a*) Failure
(*b*) Inter-costal neuritis
(*c*) Pleurodynia
(*d*) Pneumothorax

(B) **Early congestive failure of the heart:**
Treat: **Total thyroidectomy**
Contraind: (*a*) No response to conservatism
(*b*) Advanced cases with pulmonary congestion
(*c*) Coronary thrombosis with angina
(*d*) Syphilitic aortitis and arterio-sclerosis
(*e*) Low basal metabolic rate
Compl: (1) Recurrent laryngeal trauma
(2) Parathyroid trauma
After-treat: (1) Rest for four weeks
(2) Regulation of body activity
(3) Thyroid medication:
: Balance between: (α) Myxœdema
& (β) Decompensation

(C) **Coronary thrombosis and occlusion:**
Ind: Improvement of myocardial circulation
Tech: (A) **Beck's muscle graft:** Pectoralis to heart
(B) **Cardio-omentopexy:** Omentum to heart

(IV) HEART IN RELATION TO SURGERY:
(1) No type of heart disease, per se, is a contra-indication to urgent surgery
(2) Chief danger to heart, in surgery, is congestive heart failure
(3) Pre-operative medical preparation of heart is valuable in indicated cases
(4) Best clinical guides for heart conditions in surgery are:
(*a*) Respiration
(*b*) Pulse

(c) Blood pressure.
(d) Other signs of decompensation

(5) Sudden death during surgical procedures in:
(a) Obesity with fatty heart
(b) Coronary thrombosis
(c) Syphilitic aortitis

(V) CARDIAC AIR EMBOLISM:

Sources: (1) **Æro-urethroscopy**: *via* corpus spongiosum
(2) **Artificial pneumothorax**: *via* lung
(3) **Neck operations**: *via* torn veins

Clinic: (1) Sudden collapse and shock
(2) Respiratory and cardiac crisis
(3) ***Water-wheel splashing*** *on auscultation*

Treat: **Aspiration of the right ventricle:**
Site: Between 5th and 6th costal cartilages
: Close to the left sternal edge

(VI) CARDIAC ARREST:

Etio: General anæsthesia in: (a) Obesity
(b) Cardiac debility

Treat: (1) **Conservative:**
(a) Trendelenburg position
(b) **Coramine** injection
(c) Precordial: (α) Compression
or (β) Hot packs

↓ (2) **Intra-cardiac adrenaline or coramine**

↓ (3) **Massage of the heart:** Bimanual
Tech: (1) Rapid epigastric incision
↓ Bimanual massage

↓ (4) **Direct ventricular compression:**
Tech: (a) Extend the epigastric incision up
↓ (b) Free the diaphragmatic attachment
↓ (c) Compress the ventricle (within the pericardium): 30–40 times per minute

Prognosis: Bad

THE PERICARDIUM

(I) SUPPURATIVE PERICARDITIS:

Causes: (1) Direct external infection: traumatic
(2) Local regional extension: (a) Pneumonia
(b) Empyema
(3) Blood borne: septicæmic
(4) Secondary infection of pericardial effusion

Clinic: (1) Heart tamponade:
(a) Cardiac distress

(*b*) Cardiac dullness increased
(*c*) Quiet heart
(2) General toxæmia

Diag: (1) X-Ray
(2) Pericardial puncture: (dangercus)
Site: 5th left interspace one inch from left sternal margin

Treat: Pericardiostomy

(II) CHRONIC ADHESIVE PERICARDITIS:

Syn: Pick's disease

Causes: (1) Tuberculosis
(2) Suppurative
(3) Traumatic
(4) Extension from pleura or mediastinum
(5) ? Rheumatism

Path: Adhesions:
(A) Single or partial adhesions
(B) Diffuse adhesive pericarditis

(1) Centrifugal: Mediastino-pericarditis
Path: (*a*) Adhesions of pericardium to external structures
↓ (*b*) Interference with systole
Clinic: Parietal local symptoms and signs
Treat: (1) Precordial costo-chondrectomy of Brauer
(2) Phrenicotomy

(2) Centripetal: Constrictive pericarditis
Path: (*a*) Adhesions of pericardium to heart
↓ (*b*) Interference with diastole:
↓ (α) Pulmonary venous stasis
+ (β) Systemic venous stasis
+ (γ) Progressive heart failure

Clinic: Venous stasis: Pick's syndrome
(1) Œdema and cyanosis of face and chest
(2) Prominent veins
(3) Enlarged liver with ascitis
(4) Hydrothorax

Diag: X-Ray: Pericardial changes:
(*a*) Enlargement
(*b*) Fixation
(*c*) Distortion
(*d*) Calcification: (Do not operate)

Compl: Heart failure

Treat: (1) Conservative and Pre-operative:
: Rest; low salt diet; limited fluids; evacuants
(2) Operative:
(A) Removal of adhesions
(B) Pericardiectomy:
(*a*) Partial
(*b*) Total

OPERATIONS ON THE HEART AND PERICARDIUM

(I) OPERATIONS ON THE PERICARDIUM:

(1) Pericardial paracentesis:

Ind: (a) Pericarditis with effusion
(b) Suppurative pericarditis
(c) Heart tamponade

Anæsth: Local: novocain 1%

Sites: (a) Angle between xiphisternum and costal margin
(b) Left 5th inter-space, 1" from left sternal margin

Direction. Up + Back + Out (slight)

Depth. 2 5 inches from the skin

Tech: Maintain suction all the time

Compl. (a) Injury to the heart
(b) Pleurisy → empyema

(2) Pericardiotomy:

(A) **Trans-chondral:** 5th and 6th costal cartilages

(1) Local novocain infiltration
(2) Resection of 5th and 6th costal cartilages: : With inter costal bundle
(3) Ligature of int. mam. artery
(4) Division of triangularis sterni
(5) Vertical incision in the pericardium

(B) **Trans-sternal:** Sternal trephine

Adv. No interference with. (a) Int. mam. artery
(b) Pleura

Tech Trephine the sternum just above the xiphoid

(C) **Costo-xiphoid:**

Tech: Incision over the left costo-xiphoid angle

(3) Pericardiostomy: Drainage of pericardial sac

(a) Pericardiotomy: (See above)
↓ (b) Suture of the parietal pericardium to deep fascia
↓ (c) Closed drainage

(4) Pericardiectomy and cardiolysis.

Ind: Adhesions. (a) Pericardium to chest wall
(b) Heart to pericardium

(A) Cardiolysis or Precordial costo-chondrectomy of Brauer.

Def: Decostalisation of heart

Ind: Centrifugal mediastino-pericarditis

Tech: (1) Musculo-cutaneous flap
(2) Sub-periosteal resection of:
(a) 2nd to 7th costal cartilages
(b) One inch of 4th and 5th ribs
(c) Left lateral half of the sternum

(B) Pericardiectomy: Delorme

Def: Removal of anterior parietal pericardium

Tech: (1) Resection of 4th, 5th and 6th costal cartilages:
: With intercostal bundles
(2) Resection of left two-thirds of the sternum
(3) Retraction of pleura
(4) *Isolation and excision of thickened parietal pericardium*

(II) OPERATIONS ON THE HEART:

(1) Exposure of the heart:

(A) Trans-sternal:

Def: Abdomino-thoracic route of Duval-Barasty

Tech: (1) Incision: midline
: level of 2nd rib to umbilicus
(2) Longitudinal midline split of sternum
(3) Wide retraction

(B) Para-sternal:

(1) Spangaro: Intercosto-chondrectomy

Tech: (*a*) ⊢ incision left 5th interspace
(*b*) Division of costal cartilages above and below at their sternal attachments
(*c*) Retraction

(2) Kocher's quadrilateral flap:
(*a*) External hinge
(*b*) Internal hinge

Tech: Division of 3rd, 4th, 5th and 6th cost. cart.

(3) Bilateral parasternal:

Tech: Bilateral excision of 3rd, 4th, 5th and 6th costal cartilages and adjacent parts of the sternum

(4) Rib resection: Left 3rd, 4th or 5th

(5) Intercostal: 4th left interspace

(2) Cardiac trauma:

Ind: Heart tamponade

Pre-oper: (1) Anti-shock (without intravenous clysis)
(2) Screening
(3) Estimation of blood pressure

Anæsth: (1) Nil: if unconscious
(2) General
(3) Local

Steps: (1) Exposure steps:
(*a*) Spangaro
(*b*) Kocher
(*c*) Duval-Barasty
(2) Incision and evacuation of pericardium

(3) 'Palming of the heart': manual compression
(4) Investigation of heart wound
(5) Arrest of cardiac bleeding:
  (a) Local pressure
  (b) Basal pressure
(6) Apex anchor suture
(7) Wound suture:
  : Interrupted paraffin coated No. 1 silk sutu
  : During diastole
(8) Cleansing of the pericardial sac
(9) Inspection of suture line and bleeding sources
(10) Closure with or without drainage
(11) Exploration and treatment of associated traum
(12) Closure

After-treat: (1) Blood transfusion
(2) Anti-shock

Compl: (1) Shock and collapse
(2) Delirium: cerebral anæmia
(3) Pneumonia
(4) Pericarditis → pyopericardium
(5) Pleurisy → empyema
(6) Wound sepsis → mediastinitis
(7) Pericardial adhesions

(III) TRENDELENBURG'S PULMONARY EMBOLECTOMY:

Ind: When the patient is dying

Tech: Meyer's modification of Trendelenburg:
(1) Incision: (a) Vertical: along the left border of sternum
  : clavicle to 4th cartilage
  (b) Horizontal: between 2nd and 3rd ribs
(2) Sub-periosteal excision of 2nd and 3rd ribs
(3) Incision of the pericardium
(4) Passage into the sinus transversus pericardii:
  : (Encircling the base of aorta and pulmonary artery):
  (a) Index finger
  ↓ (b) Trendelenburg introducer
  ↓ (c) Rubber tube
(5) Traction on the rubber tube
(6) Incision in the pulmonary artery
(7) Introduction of the embolus forceps: (thrice)
  (a) Right artery: forceps horizontal
  (b) Left artery: forceps vertical
(8) Application of arterial clip to the incision
(9) Suture of the arterial slit: fine paraffined interrupted sutures
(10) Closure of: (a) Pericardium
  (b) Muscles
  (c) Skin

IMPORTANT POINTS

(A) **Trauma:**

(1) Surest signs of cardiac injury are:
   (1) Enlargement of heart shadow
   (2) Diminution or absence of heart movements
   (3) Progressive fall in blood pressure.

(2) Beck's clinical triad of cardial tamponade:
   (1) Low arterial pressure
   (2) High venous pressure
   (3) Quiet heart.

(3) Auricular wounds in particular are very liable to produce heart tamponade.

(4) Results of non-operative treatment of heart wounds are extremely poor compared with those of a well chosen operation (for heart tamponade).

(5) In heart injuries, every patient who reaches the theatre with the least evidence of cardiac function should be operated upon.

(6) If the instrument of trauma be in situ, in stab wounds of the heart or near about great arteries, it should not be withdrawn till the patient is under actual operation.

(B) **Coronary cardiopathies:**

(7) In every case of acute upper abdomen, remember coronary thrombosis.

(8) Three ways in which heart can be influenced by neuro-surgical attack:
   (*a*) Vaso-motor
   (*b*) Motor or pressor
   (c) Sensory.

(9) Any sympathectomy sufficiently extensive to be of service must interrupt all these three kinds of cardiac innervation (See 8), though not to an equal degree.

(10) Although total thyroidectomy relieves distressing anginal attacks and other coronary cardiopathies, its best results are in early congestive failure.

(11) In congestive failure of the heart, total thyroidectomy changes the state of decompensation to that of compensation within four weeks.

(12) Best results from total thyroidectomy are obtained in those patients with chronic congestive failure due either to rheumatic or hypertensive processes, who can be restored to compensation when at rest in bed. Those who do not respond to rest in bed and ordinary medical treatment, are likely to derive little benefit from the operation, which is hazardous in them.

(13) Myxœdema only appears when the metabolism is lowered to 30%

(14) In coronary sclerosis and myocardial degeneration, operation is contra-indicated except in order to save life.

(C) **Pericardium:**

(15) Suppurative pericarditis is a common complication of:
- (*a*) Pneumonia
- (*b*) Empyema
- (*c*) Pyæmia
- (*d*) Septicæmia.

(16) Chief difficulty in the diagnosis of suppurative pericarditis lies in the fact that it is almost invariably secondary to infection elsewhere and there is lack of localising symptoms.

(17) Repeatedly examine the cardiac area in every septic case to exclude suppurative pericarditis.

(D) **Operations:**

(18) Main indications for heart surgery:
- (1) Trauma: (*a*) Arrest of hæmorrhage
  - (*b*) Suture of wounds
- (2) Coronary cardiopathies:
  - (*a*) Angina: Sympathectomy
  - (*b*) Thrombosis: (α) Beck's muscle graft
    - (β) Cardio-omentopexy
  - (*c*) Heart failure: Total thyroidectomy
- (3) Pericardium:
  - (*a*) Pyopericardium: Pericardiostomy
  - (*b*) Pericardial adhesions: Pericardiectomy
- (4) Cardiac restoration: Bimanual massage
- (5) Pulmonary embolism: Trendelenburg.

(19) Heart exposure routes:
- (1) Trans-sternal: Duval-Barasty: abdomino-thoracic
- (2) Para-sternal:
  - (*a*) Spangaro: intercosto-chondrectomy
  - (*b*) Kocher: quadrilateral flap
  - (*c*) Bilateral parasternal
  - (*d*) Rib resection
  - (*e*) Intercostal.

(20) The danger of paracentesis pericardii is greater than that of an exploratory pericardiotomy and so para-

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